

KALAMAZOO

Community Sustainability Plan



CITY OF KALAMAZOO, MICHIGAN

RESOLUTION NO. 22-33

A RESOLUTION TO ADOPT A COMMUNITY SUSTAINABILITY PLAN

Minutes of a regular meeting of the City Commission of the City held on June 21, 2022 at 7:00 p.m., local time, at 241 W. South Street, Kalamazoo, Michigan.

PRESENT. Commissioners: Decker, Hess, Hoffman, Juarez, Praedel, Vice Mayor Cooney, Mayor Anderson

ABSENT, Commissioners: None

The following resolution was offered by Commissioner Hess and supported by Commissioner Decker:

WHEREAS, the City Commission recognizes the important of protecting the long-term health and resilience of the environment, society, and economy in Kalamazoo, and,

WHEREAS, the City Commission passed Resolution No. 19-59 declaring a climate emergency that recognized the threat climate change presents to our citizens, city, regional, state, and the natural world, and,

WHEREAS, the City Commission recognizes that investment in sustainability actions, such as reducing carbon emissions, has positive outcomes that extend beyond environmental benefits, including enhancing social equity, maintaining a strong economy, and improving public health, and,

WHEREAS, climate change will continue to impact the affordability of basic human necessities such as food, housing, healthcare, transportation, and energy, adding additional pressure on persons and households of low-income and challenging Kalamazoo's goals within the Strategic Vision and Imagine Kalamazoo 2025, and,

WHEREAS, City staff and community stakeholders worked together on a Community Sustainability Plan which is guided by four principles:

1. The plan must be community-wide with actions that consider our local sphere of influence and political realities.

2. Everyone must be included in realizing the benefits of sustainability actions, and priority given to those with the highest need or burden.
3. Kalamazoo is responsible for its contributions to climate change and will strive to be carbon neutral by 2050 or earlier.
4. Nature-based solutions must be used to create a more resilient and healthier community.

THEREFORE, IT IS RESOLVED, the City Commission finds that the Community Sustainability Plan creates a vision for a more sustainable and resilient Kalamazoo, and,

BE IT FURTHER RESOLVED, the Community Sustainability Plan proposes a framework for continuous improvement and strategic implementation and will be evaluated annually with input from community stakeholders, and,

BE IT FURTHER RESOLVED, the City Commission adopts the Community Sustainability Plan to realize its vision for a Healthy, Green City and to implement climate actions called for in Imagine Kalamazoo 2025.

AYES, Commissioners: Decker, Hess, Hoffman, Juarez, Praedel, Vice Mayor Cooney, Mayor Anderson

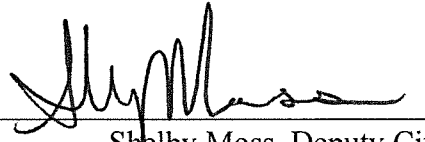
NAYS, Commissioners: None

ABSTAIN, Commissioners: None

RESOLUTION DECLARED ADOPTED.

CERTIFICATE

The foregoing is a true and complete copy of a resolution adopted by the City Commission of the City of Kalamazoo at a regular meeting held on June 21, 2022. Public notice was given and the meeting was conducted in full compliance with the Michigan Open Meetings Act (PA 267, 1976). Minutes of the meeting will be available as required by the Act.


Shelby Moss, Deputy City Clerk



Contents

1: Introduction	6
2: Accessible Complete Network	26
3: Affordable Efficient City	56
4: Healthy Prepared Community	88
5: Green Circular Economy	120
6: Implementation	140
APPENDIX A	168
APPENDIX B	176
APPENDIX C	186



Introduction

Acknowledgments

The Sustainability Strategy is the work of many individuals, community groups, and organizations who contributed their valuable time, ideas, and support throughout the engagement process.

Environmental Concerns Committee

- Aaron Wright, Chair
- Ian Magnuson, Vice-Chair
- Sharon Dever
- Robb Liekis
- Dr. Gail Walter
- Nicole Olweean
- Eric Brown
- Bobby Glasser
- Wayne Bond
- Joe Bower
- Dr. James Melliush
- Malissa Drzick, Staff Liaison
- Comm. Jeanne Hess, Commission Liaison

Sustainability Advisory Committee

- Dan Bair
- Karen Conley, IT Dept
- Jenny Doezema
- John Esch
- Dr. Denise Keele
- Mark Lee
- Rachael Luscomb, CPED
- Ian Magnuson
- Paul Manstrom
- Brendan Molony
- Carolyn Real
- Mary Ann Renz
- Robert Roznowski

- Jessica Simons
- Tom Small
- Jeff Spoelstra
- Ryan Stoughton, Public Svcs

City of Kalamazoo Staff

- Christina Anderson, CPED
- James Baker, Director, Public Svcs
- Dan Baisden, former staff
- Nolan Bergstrom, CPED
- Dorla Bonner, DEI Director, CMO
- Jeff Chamberlain, Deputy, CMO
- Amanda Cockroft, CMO
- Sharon Ferraro, former staff
- Sean Fletcher, former staff
- Rebekah Kik, Director, CPED
- Anthony Ladd, Public Svcs
- Laura Lam, Deputy, CMO
- Jamie McCarthy, CPED
- Patrick McVerry, Interim Director, Parks
- Antonio Mitchell, CPED
- Dennis Randolph, Public Svcs
- Katie Reilly, former staff
- Steve Vicenzi, Management Svcs

Partners & Reviewers

- Rachel Bair
- Ben Brown
- Mark Lee
- Paul Manstrom

- Derek Nofz
- Chad Oberdoerster
- Kathy Schultz, Kalamazoo Metro

Focus Groups & Interviews

- Comm. Chris Praedel, City Commission
- Eric Brown
- Chris Broadbent
- Justin Gish
- Mary Clare Griffith
- Scott Schmidt
- Wendy Burlingham, Public Svcs
- Brian LaBelle, Public Svcs
- Matt Milcarek
- Chris Patchell
- Philip Dietrich
- Brian Vogl
- Hristina Petrovska
- Tom Tishler
- Rachel Hughes-Nilsson
- Adam Castle
- Kalamazoo Area Wild Ones (2/26/20 mtg)

Interns

- MSU School of Planning, Design, and Construction - Project Team
- Gina DeGraaf, Kalamazoo College
- Samuel Meyer, Kalamazoo College
- Kayla Carlson, Kalamazoo College

"If we long for our planet to be important, there is something we can do about it. We make our world significant by the courage of our questions and by the depth of our answers."
 Carl Sagan, Cosmos

Introduction

In October 2019, the Kalamazoo City Commission adopted a resolution declaring a climate emergency (see Appendix A). The resolution pointed to local government and community partners to take bold action to stop the harmful impacts of climate change. City of Kalamazoo (City) staff had just begun the planning process for a sustainability plan. At the same time, City Commission was challenged with many other issues. There was a need to expand the Natural Features Protection district, replace tens of thousands of lead-lined drinking water pipes, and find solutions to the fair and affordable housing crisis. The community needed a broad plan to address the climate and sustainability issues facing Kalamazoo.

“... the City of Kalamazoo declares that a climate emergency threatens our citizens, city, region, state, and the natural world”
 - Excerpt from 2019 Climate Emergency Declaration

The Community Sustainability Plan (CSP) grew out of many needs. The CSP is a forward-looking plan that guides decisions at the city- and community-level. It includes actions for everyone – at home, work, school, and within organizations. The overarching vision is a resilient and sustainable Kalamazoo. One that considers the prosperity of current and future Kalamazooans. The plan blends many City goals and objectives into one cohesive strategy to inspire systems thinking. It is action-oriented and focused on community outcomes. It is guided by Kalamazoo’s Strategic Vision for a green and healthy city.



How is Sustainability Defined in this Plan?

Sustainability is defined as meeting the social, economic, and environmental needs of today’s generation while not jeopardizing future generations’ ability to meet its needs.

To be sustainable, a community must use resources efficiently and fairly. We must build this equitable “future-focus” into all our community systems and decision-making. The CSP has actions to change systems to be more climate friendly. It focuses on making Kalamazoo more resilient to severe weather in the most vulnerable places. The strategies in the plan use an equity lens to prioritize action.

Sustainability in a Changing Community & Climate

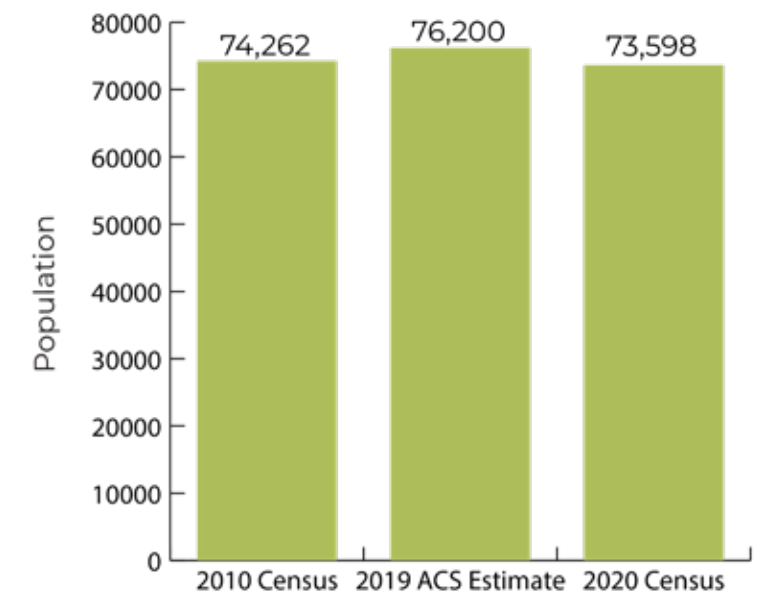
The population size in Kalamazoo has not changed greatly over the last ten years (ACS, 2010, 2019b; U.S. Census, 2020). And while the City is landlocked and not growing in land area, it is poised for continuous change (Levin et al., 2021). Issues we face like a shortage in affordable housing will require more construction of homes and apartments.

The climate in Kalamazoo is changing. Over the last several decades, Kalamazoo has experienced a 40% increase in heavy rainstorms (GLISA, 2020). High heat days where the temperature is above 90°F are predicted to increase by the middle of this century (GLISA, 2020; U.S. Dept. of Commerce via NOAA, 2021). Currently, in Kalamazoo we have around 10 high heat days each year. By 2050, we could have as

Sustainability

Meeting the social, economic, and environmental needs of today’s generation while not jeopardizing future generations’ ability to meet its needs.

Population Change from 2010 - 2020



Population change in the City of Kalamazoo from 2010 - 2020. Disclaimer: the American Community Survey (ACS) estimate has a margin of error.

many as 20 to 40 high heat days each year (NOAA, 2022). The CSP acknowledges and responds to this change. For example, emergency response plans must factor in new conditions like longer stretches of high heat days.

The CSP also calls for tracking and reducing our carbon footprint. A carbon footprint is the total carbon gas released into the air from a certain activity or location. The smoke from a car tailpipe or a home chimney are examples of carbon gas going into the air. The science community agrees, these carbon emissions drive climate change (United Nations, 2015, 2022; IPCC, 2021). We need zero carbon emissions by 2050 or earlier to avoid the worst climate change (Riggs et al., 2021). In this plan you will see the term "net-zero carbon". This means some emissions will remain, but they must be offset by actions such as planting trees that absorb carbon.

Who is the Community Sustainability Plan for?

The CSP is a community-wide plan focused on the role city government can play to advance sustainability. The plan does not include all actions necessary to stop climate change or fully develop sustainable systems. We need many champions, partners, and stakeholders to reach these. The plan is a starting point and call to action to bring people and partners together on sustainability topics.

The CSP is grounded in current political and cultural realities and recognizes the limits of existing technology. It also anticipates the future. As technology and policy advances, the CSP sets up a

The climate in Kalamazoo is changing.

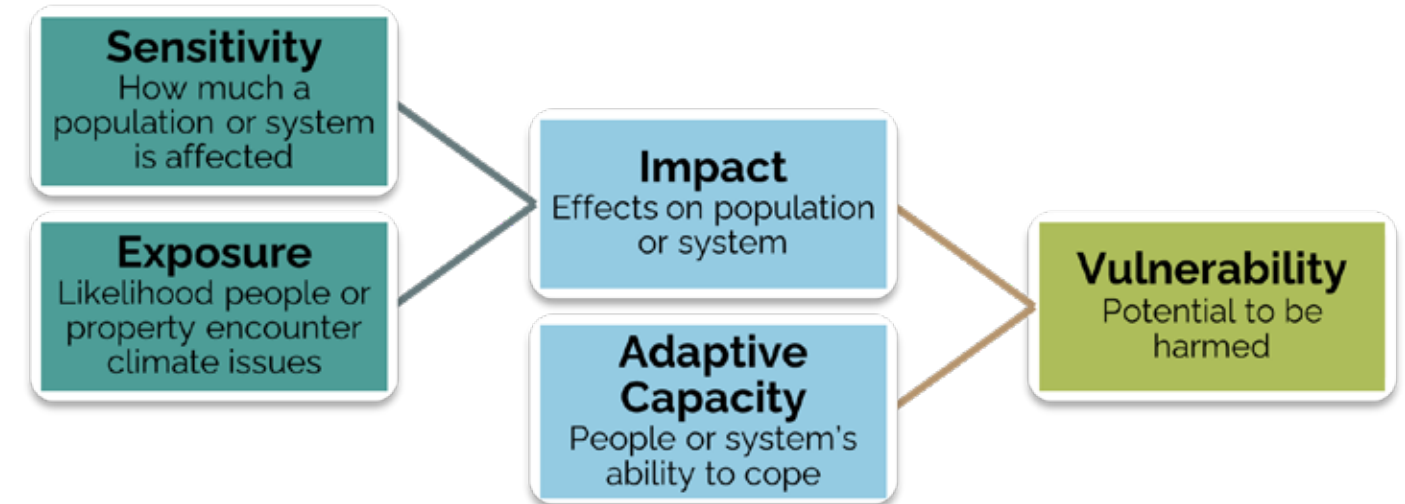
By 2050 the number of high heat days (above 90) each year could increase from 10 currently to 20-40

Over the last several decades, Kalamazoo has had a 40% increase in heavy rainstorms

This plan calls for emergency response plans for new climate conditions.

We need zero carbon emissions by 2050 or earlier to avoid the worst climate change

This plan calls for tracking and reducing our carbon footprint (total carbon released into the air) by both reducing and offsetting emissions to achieve "net-zero carbon".



Factors used to determine a population, place, or system's vulnerability to climate change (GLISA, 2020).

process of re-evaluation. The process will allow us to improve strategies and outcomes in a flexible and responsive way.

Vulnerable People

The CSP serves as a roadmap for the entire community while prioritizing the most vulnerable people, places, and infrastructure. To understand vulnerability to climate change, we need to look at several conditions in context. The flow chart above shows the different factors that influence climate vulnerability. When systems are in place that help people or infrastructure cope with or adapt to change, they are less vulnerable. A community with low vulnerability is more resilient to climate change. Building more adaptive capacity, or ability to cope with change, will build a stronger and more resilient Kalamazoo.

Sensitivity and climate risk is strongly tied to socio-economic characteristics of a community. Some people are more likely to struggle with social, health, or economic issues due to things like race, age, poverty, and education level. Climate change can

create more challenges for people over time. Much of this inequity is linked to racial injustices and other social determinates of health.

Vulnerable Places

Where people live also influences sensitivity and risk. Not all areas of the City will feel the same impacts from climate change. For example, high heat days will be worst in areas of the City with fewer trees. Neighborhoods with higher air pollution could experience more health complications on high heat days.

Staff used the Neighborhoods at Risk (2021a, 2021b) tool developed by Headwaters Economics to identify at-risk people, places, and infrastructure for the CSP. The interactive tool maps vulnerability by showing census tracts with more risk factors. This is explored further in Chapter 4: Healthy Prepared Community.

Community Sustainability Plan and the City's Planning Framework

The City's Strategic Vision guides all plans created

by City departments and sets the direction for implementation. The CSP is designed to align with the Strategic Vision and support Imagine Kalamazoo 2025 and the City's Master Plan. In some cases, the CSP shares complementary goals with other City plans and policies. In this case, staff will track progress toward CSP goals in collaboration with other plans.

Strategic Vision

The Strategic Vision alignment table shows how the goals in the CSP carry through the City Commission's vision for Kalamazoo.

Imagine Kalamazoo 2025 – Master Plan

Supporting Imagine Kalamazoo, the 2025 Master Plan, and neighborhood plans is crucial in understanding how the plan is workable. The CSP fits in between the 10- and 5-year plan alignment. It features actions that will be continuously be reviewed and updated. That is what makes this plan unique. It sets long, mid-, and short-term goals with actions that need to be adaptable to fiscal, environmental, policy, and technology conditions. The CSP will respond to and influence the City's Capital Improvement Plan (CIP). Successful implementation will require seizing new funding opportunities, as well as leveraging volunteer and staff support.

Neighborhood Plans

Staff compared the goals and actions in Kalamazoo's neighborhood plans with responses from the Community Sustainability Survey. There was consensus on topics like increasing tree canopy, protecting natural habitat, and concerns about flooding. Many neighborhood plans focus on

improving housing and reducing energy costs for quality of life and affordability. These actions were built into the CSP for climate and sustainability outcomes as well.

Building on What's Been Done

Kalamazoo is already making progress toward a sustainable future. Over the past decade, many community partners and institutions have championed sustainability and climate initiatives. This work has improved many aspects of life in Kalamazoo. Together Kalamazoo partners adopted a complete streets policy, replaced thousands of lead drinking water lines, developed climate action reports and recommendations, inventoried municipal emissions, passed a fair housing ordinance, and advanced affordable housing initiatives with green certifications and solar installations. Kalamazoo has been a state leader in local and sustainable food systems, taking on new recycling initiatives, and elevating thousands of voices to address the climate emergency.

Building on what has been done, we need to press forward to address the climate crisis and other sustainability issues. This plan establishes a framework to prioritize and address these issues. The outcomes of the plan will yield meaningful community changes now and into the future. The goal is to create space for more people and places in the City to engage on topics in the plan. This plan seeks to honor the work that has been done and accelerate action.

Strategic Vision Alignment

Strategic Vision Goals	SP	CC	IPP	ER	SC	YD	CN	SD	EV	GG
	Shared Prosperity	Connected City	Inviting Public Places	Environmental Responsibility	Safe Community	Youth Development	Complete Neighborhoods	Strength Through Diversity	Economic Vitality	Good Governance
Sustainability Strategy Sections										
Accessible Complete Network										
Goal 1: Design a greener transportation network	●	●		●	●		●			
Goal 2: Increase density for safe, accessible, & equitable travel		●	●	●			●		●	
Goal 3: Make transit a more viable option for more trip types & users	●	●		●	●		●			
Affordable Efficient City										
Goal 4: Accelerate local renewable energy investments	●	●		●	●			●	●	●
Goal 5: Transform buildings & behavior to save energy and money	●			●	●			●	●	
Goal 6: Decrease emissions from City vehicles, equipment, & infrastructure		●	●		●					●
Healthy Prepared Community										
Goal 7: Protect the natural environment for urban resilience	●		●	●	●		●		●	●
Goal 8: Support a healthy & resilient community	●		●	●	●		●			●
Green Circular Economy										
Goal 9: Support systems for local food on multiple scales	●		●	●	●	●	●	●	●	
Goal 10: Reduce waste & support market for waste recovery	●	●		●	●				●	●

The matrix shows how the Community Sustainability Plan aligns with the City's Strategic Vision Goals.

Developing the Community Sustainability Plan

Staff followed the Public Participation Plan to engage the community in different ways. The CSP was informed by City departments, environmental professionals, content and context experts, residents, and regional stakeholders. During the planning phase, staff determined the impact of the CSP was large scale and high impact. We used surveys, focus groups, and advisory and review committees to consult and collaborate on the plan.

Planning Process

Step 1. Initiate Project

The City held a kick-off event in fall 2019 to gather early ideas from the public and sustainability stakeholders. A variety of information was gathered from living wall posters and pop-up engagement booths.

Step 2. Initial Community Engagement

A Community Sustainability Survey was created in English and Spanish in online and paper format. Staff and community partners did Meetings-on-the-Go to encourage residents and neighborhood leaders to complete the survey. An advisory committee was formed with internal City staff and external stakeholders. This group helped set guiding principles and informed the major topics, themes, and goals.

Step 3. Focus Groups & Consult Sessions

In 2020, several focus groups were convened to dive deeper into strategies and actions. These included topics such as waste, biodiversity, tree canopy, and building performance. Staff also used 1:1 consult sessions to gather specific information on emergency preparedness, public transit, and local food systems.

Step 4. Draft Plan

The draft CSP was developed using all the public engagement and consultation data collected in 2019 and 2020. Staff consulted with staff experts from all City departments.

Step 5. Department & Practitioner Review

Intradepartmental review sessions were held for each themed chapter of the plan. External stakeholders were also invited to review the draft plan. These reviewers represented "practitioners" in the field who have a strong understanding of the different systems and community needs.

Step 6. Final Community Engagement

The draft CSP was presented to the public through a series of videos, presentations at public board meetings, and community meetings.

Step 7. Final Plan

Step 1

INITIATE PROJECT

Kick-off event with living wall posters and pop-up engagement booths.

Step 2

INITIAL COMMUNITY ENGAGEMENT

Community Sustainability Survey, Meetings-on-the-Go, and an advisory committee was formed.

Step 3

FOCUS GROUPS & CONSULT SESSIONS

Focus groups dove deeper into strategies and actions, and specific topic areas.

Step 4

DRAFT PLAN

A draft plan was informed by public engagement, consultation data, and staff expertise.

Step 5

DEPARTMENT & PRACTITIONER REVIEW

City staff and external practitioners reviewed the draft plan considering systems and community needs.

Step 6

FINAL COMMUNITY ENGAGEMENT

Presenting the draft CSP to the public

Step 7

FINAL PLAN





Public Participation Process

The existential threat of climate change can be difficult to connect to our everyday lives. Staff designed engagement activities to focus on relevant local issues identified in IK 2025. These issues were connected to climate change and sustainability as we went out into the community. We used several engagement tools to try to meet people where they were.

Community Event – Kick-off event organized with local food, organizations, and sustainability topics to gather early input, recruit committee members, and advertise the survey

Advisory Committee – Committee of internal City staff and external stakeholders convened monthly at the beginning of the process to explore sustainability topics, key concerns, and opportunities

Community Sustainability Survey – Public survey in English and Spanish used to gauge interests, concerns, and values

Meetings on the Go – Short presentations

at neighborhood association and community organization meetings

Pop-up Engagement Booths – Pop-up booths were set up at community events to gather public input

Focus Groups – Smaller convenings of people knowledgeable of, connected to, or working on specific topics

1:1 Consultation Meetings – 1:1 meeting with people knowledgeable of, connected to, or working on specific topics

Direct Presentations – Longer presentations at meetings or classes focused on sustainability

Survey Results

The advisory committee helped staff create a community sustainability survey. The purpose was to understand the community's knowledge of climate change, behaviors, interests, and guide future public education. The survey was offered online and in paper format in both English and Spanish. It was advertised through City social media accounts, neighborhood

associations, flyers at pop-up booths and meetings, and copies at City offices.

We received 584 survey responses over a four-month period. The survey was filled out by some of the most environmentally minded people in the community. Respondents were knowledgeable about climate change and thought about it often (76% thought about climate change daily). Over 65% said they felt climate change was impacting their life now.

Most respondents lived in the City of Kalamazoo (87%). The survey responses were not well distributed across neighborhoods. The highest number of responses came from Oakland Drive Winchell and Vine neighborhoods (17% and 13%, respectively). Edison, Milwood, Westnedge Hill, and Westwood neighborhoods were the next highest represented in the survey (about 7% each).

The survey asked several questions about willingness to adopt environmentally friendly practices. Staff and the advisory committee used this input when selecting themes and topics for the CSP. For example,



70% of respondents mentioned green space/trees as their most valuable natural features

survey questions asked about eating more plant-based foods and willingness to grow food at home. The survey indicated that people are interested in and need help with home gardening. This is an

By the Numbers



270
Meetings-on-the-Go Participants



584
Surveys Completed



14
Presentations



8
Pop Up Engagement Booths



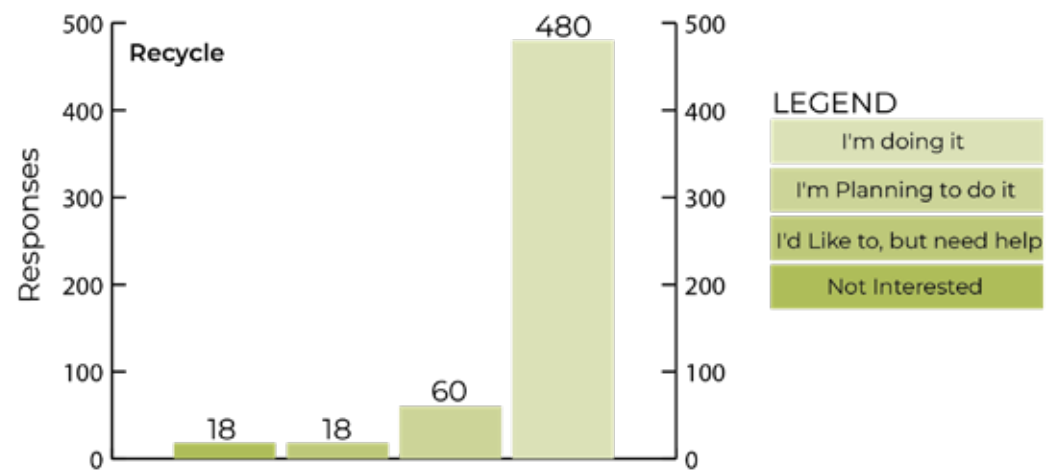
138
Focus Group & 1:1 Consult Meeting Participants

opportunity for the community to learn about and adopt a healthy, resilient, and climate friendly practice at home.

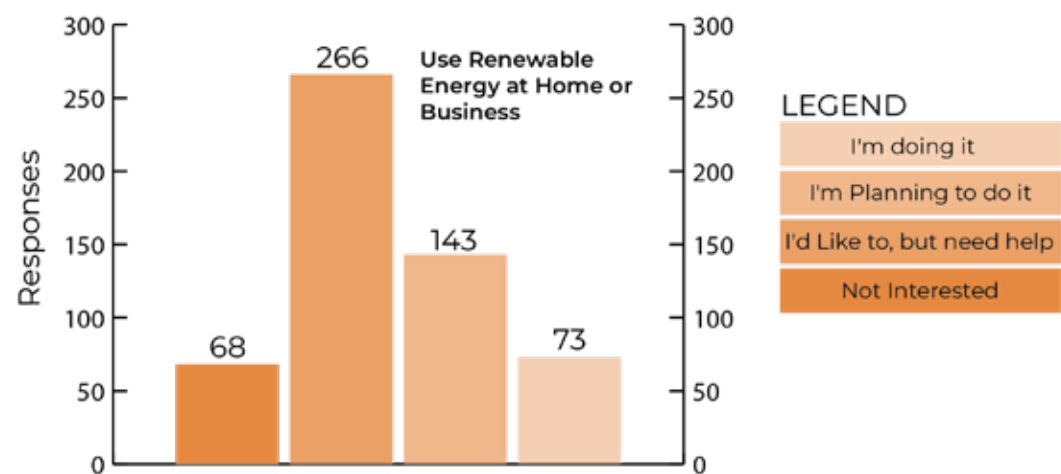
From the survey, most people had high willingness to recycle and use renewable energy at home or business. Most were already recycling at home. The survey revealed that more people are interested in learning about renewable energy and need help than those not interested.

The survey process helped staff recognize shortfalls in the engagement process. The lessons learned will be used in the future to create more robust engagement. Many of the strategies in the CSP will require leadership and input from different people and places. In many cases, the City will serve as connector, guide, resource, and advocate. Those impacted by and motivated to do this work will need space to step forward and shape implementation and outcomes.

How likely are you to do the following environmentally-friendly actions?



How likely are you to do the following environmentally-friendly actions?



What's in the Community Sustainability Plan?

Guiding Principles

The advisory committee helped develop guiding principles for this plan. The committee used the City's strategic goals as a foundation to set CSP principles. The plan does not separate climate action, racial equity, or resiliency into its own chapters. Instead, these key principles are woven throughout the entire plan. The plan is framed around four principles.

- Local and Community-Wide**
 Not only focused on municipal facilities and operations, the CSP is a community-wide plan for all Kalamazooans with practical actions that consider our local sphere of influence and political realities
- Shared Prosperity**
 Viewed through a sustainability lens, this means everyone is included in realizing the benefits of sustainability actions, and priority is given to those with the highest need or burden
- Climate Accountability**
 The CSP recognizes Kalamazoo shares responsibility for the causes of the climate crisis and strives for a net-zero carbon future by 2050 or earlier
- Interconnected and Resilient**
 Acknowledging the interconnectedness of people and nature, our work must leverage nature-based solutions in the urban environment to create a more resilient and healthier Kalamazoo

Themes


A wide variety of community voices helped develop the key themes in this plan. Staff used input from surveys, focus groups, and advisory committee work sessions to identify important sustainability topics. The plan consolidates these topics into four key themes.

- Accessible Complete Network** includes best practices in sustainable land use and greener transportation systems
- Affordable Efficient City** includes actions for cleaner, safer, and more affordable buildings and energy
- Healthy Prepared Community** includes protecting community healthy and the natural environment
- Green Circular Economy** includes ways to support local food systems and reduce and recover waste



Goals, Strategies, and Actions

Within each of the four themes, the CSP has goals, strategies, and actions. The 10 goals describe the long-term achievements needed to support a sustainable future. Each goal has many strategies and actions. Strategies are targeted game plans that will move us forward to accomplish a goal. Actions are specific tasks necessary to implement a strategy. They are meant to be flexible. The City will review and adapted actions to respond to current and future needs and conditions.



Accessible Connected Network

GOALS

- Design a greener transportation network that easily and safely connects all users to places they need to go
- Strategically increase residential density to facilitate safe, accessible, and equitable travel
- Make transit a more viable option for more trip types and users



Affordable Efficient City

GOALS

- Accelerate local renewable energy investments
- Transform buildings and behavior to save energy and money
- Decrease emissions from City vehicles, equipment, and infrastructure assets



Healthy Prepared Community

GOALS

- Protect the natural environment for urban resilience
- Support a healthy and resilient community



Green Circular Economy

GOALS

- Support systems for local food production and distribution on multiple scales
- Reduce community waste & support market solutions for waste diversion and recovery

How to Read the Plan

Each chapter of the CSP does a deep dive into the goals, strategies, and actions for the four sustainability themes. The chapters start with important background information about why a strategy was chosen. Kalamazoo-specific data was used whenever possible. Feasibility is also important in selecting a strategy. This framework will help equitably invest in places, people, and infrastructure. The four themed chapters include a summary graphic for each strategy. Here is how to read the summary boxes (numbers correspond to numbers on example summary graphic for easy reference).

- 1. Strategy** appears at the top of each summary box.
- 2. Actions** for each strategy are described briefly below the heading. More information on each of the actions can be found in the chapter narrative.
- 3. Feasibility** is shown on a sliding scale. The feasibility of each strategy was determined through a scoring system. This system is described more in Chapter 6: Implementation.
- 4. Actionable** strategies are those where:
 - Staffing or partners are in place
 - Funding is available or cost is low
 - Timeline to complete is short
- 5. Aspirational** strategies are those where:
 - No champion or lead partner exists
 - Cost is high and no funding is identified
 - Timeline to complete is long or complex
 - Technology or policy is not yet developed

Example Summary Graphic

1 Support local food incubators and innovation hubs

ACTIONS:

- Seek funding and partnerships to increase infrastructure, workforce training, and economic development tools to support local food industry
- Allow small-scale composting and other green businesses within the city in residential and commercial districts

3

FEASIBILITY: Opportunistic

Actionable

4

5

Aspirational

CITY ROLE:

6 Act

Connect

Advocate

TIMELINE:

7 Short

Mid

Long

Extended

8 COST: \$ \$ \$ \$ \$

6. City Role describes how the City will act on or support the strategy. "Act" means City staff have a leading role in implementing the project. "Connect" means City staff will be a supporter and connect different partners and stakeholders. "Advocate" means City staff will act as guide or resource for aspects of the strategy.

- 7. Timeline** ranges from short to extended. Short-range is 1-2 years, mid-range is 3-5 years, long-range is 6-10 years, and extended is more than 10 years.
- 8. Cost** shows the relative investment that may be needed. It will vary based on what actions are implemented. More cost scoping will be needed for most strategies and actions.
- \$ 0-100,000 dollars, or funding committed
 - \$\$ 100,000 – 500,000 dollars
 - \$\$\$ 500,000 – 1,000,000 dollars
 - \$\$\$\$ >1,000,000 – 10,000,000 dollars
 - \$\$\$\$\$ >10,000,000 dollars

Who Does the Work?

The action table in Chapter 6: Implementation list the City department or division that will lead each action. City boards and commissions will be involved in actions around policy and incentives. The table also lists collaborators. Collaborators are additional partners and stakeholders that will need to be involved in an action. In some cases, a strategy or action will require new champions or partnerships. Groups and individuals interested in supporting implementation can use this table to find opportunities.

Co-Benefits

The actions we take to reduce carbon emissions and adapt to climate change can create other benefits. These other benefits are called co-benefits in this plan. For example, actions to reduce air pollution for climate change also protect respiratory health for residents. Increasing green space to adapt to high

heat days can have stormwater and biodiversity benefits. There are several common climate co-benefits mentioned throughout this plan, including health, jobs, clean water, social equity, affordability, and environment (Floater et al., 2016).

Understanding the Language

The topic of sustainability and climate can feel like it has its own language. The CSP includes a glossary of terms and acronyms in Appendix B. The glossary is a helpful reference when unfamiliar words or abbreviations show up in the plan. The CSP also mentions scientific and academic literature and studies. A complete list of references is included in Appendix C.



Accessible Complete

Network

THE U.S. CANNOT REACH ITS CARBON EMISSIONS TARGETS IF CITIES CONTINUE TO SPRAWL AS THEY HAVE IN THE PAST. IN KALAMAZOO, WE CAN DESIGN NEIGHBORHOODS AND TRANSPORTATION NETWORKS THAT PROVIDE BETTER ACCESS FOR ALL USERS. WE CAN BUILD A SYSTEM THAT ENCOURAGES NON-MOTORIZED TRANSPORTATION TO BECOME A SAFER AND MORE SUSTAINABLE COMMUNITY.

In the U.S., our buildings use more energy and personal vehicles drive more miles per capita than anywhere else in the world (Tomer et al., 2021). We must change where we build and how we travel to solve the climate crisis. We need policies and plans that encourage smart urban design and development patterns (Smarth Growth America, 2019). Electric vehicle infrastructure, public transit, and more dense and efficient housing are key strategies to lower our carbon emissions.

To position our community and mobility network for success in the future, this plan envisions a future Kalamazoo where residents have a safe, equitable, and accessible mobility network and reliable public transit system. The mobility network must provide better access for all users and encourage non-motorized transportation.

To achieve this sustainability vision, three goals have been set forth:

- Design a greener transportation network that easily and safely connects all users to places they need to go
- Strategically increase residential density to facilitate safe, accessible, and equitable travel
- Make public transit a more viable option for more trip types and users

Introduction

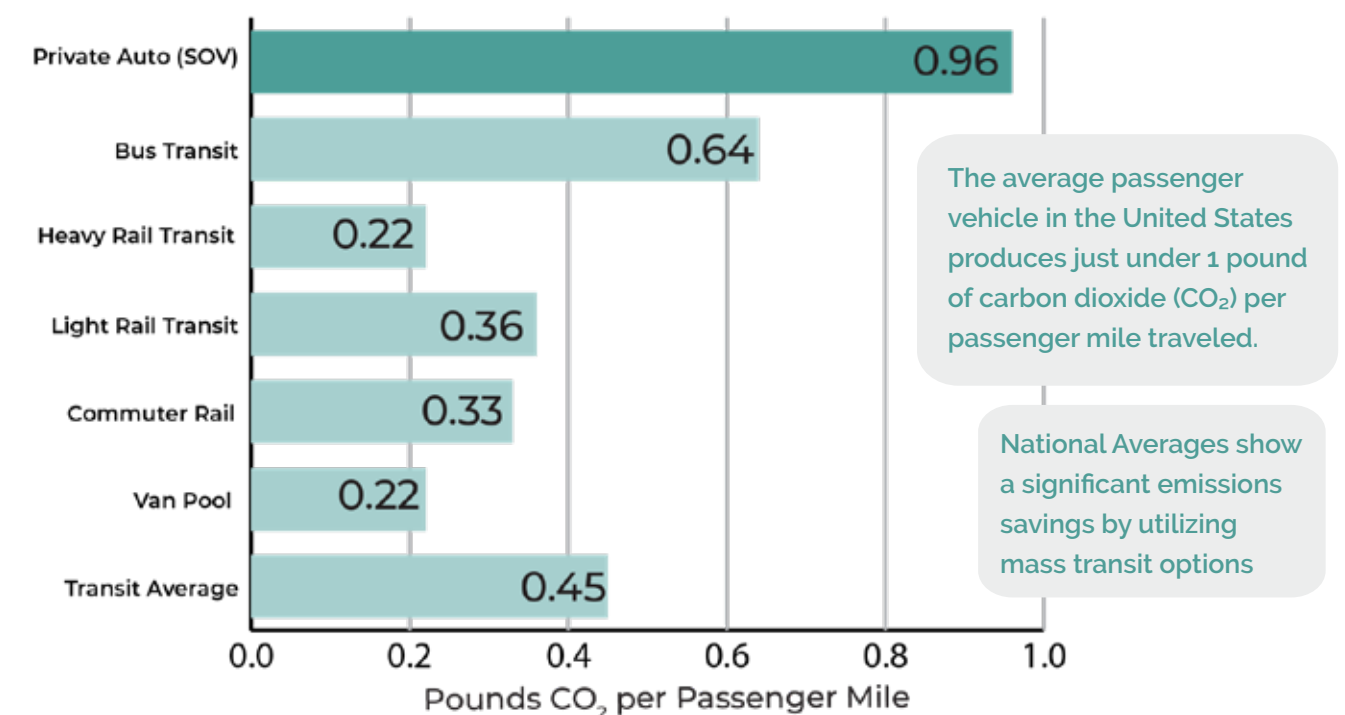
Transportation is an important part of everyday life. It connects us to work, services, and fun. In Kalamazoo, a key strategy for climate resilience will be encouraging density and development in areas closer to people's needs. We must transform existing urban development patterns into a system that significantly reduces the miles we travel by car. Smart land use tied together with a greener transportation system can help us reduce carbon emissions and improve health and quality of life. This change is best deployed at the local level where regional and municipal planning has significant levers to shape land use and urban design. The Community Sustainability Plan (CSP) leverages other existing plans to advance smart urban growth and greener transportation.

Understanding Transportation in Kalamazoo

In Kalamazoo, the transportation network is made up of intersecting streetscapes, trailways, bus stops, and stormwater facilities. Different parts of the network are managed by different entities. Local, regional, and state agencies plan, operate, and maintain different streets and the public right-of-way. Many of the strategies in the CSP can be influenced by City government. Other parts of the system, such as public transit and State-owned streets will require close collaboration with regional partners. All planning and funding for transportation is long-

Estimated CO₂ Emissions for Public Transit and Private Vehicles

(Adapted from Federal Traffic Administration Figure)



range. Some of the different layers of planning and operation include:

2025 Master Plan & Capital Improvement Program

The City is responsible for developing and implementing its comprehensive land use plan, or Master Plan, on a 10-year schedule. The plan integrates land use and transportation by setting a vision for future land development. Future land use designations are more visionary than zoning districts and development standards. They provide guidance on appropriate land uses if a parcel were redeveloped in the future. Designations like Neighborhood Node help guide the scale and match the streetscape to the intended use.

While the Master Plan cast the vision for land use and transportation, the Capital Improvement Program (CIP) brings it to life. This five-year program is an outlay of

Capital Improvement Program (CIP)

A five-year program that outlines funding at the City to support changes and improvements in the transportation network for major and local streets

Kalamazoo Area Transportation Study

KATS and their 2045 Metropolitan Transportation Plan is the overarching driver for transportation funding and transit planning in our area

funding to support changes and improvements in the transportation network. For transportation, the CIP helps implement changes and improvements to major and local streets in the City. The CIP and other grants guide investment into sidewalks and other right-of-way improvements.

Public Transit

The public transit system in Kalamazoo is operated by a Central County Transportation Authority known as Metro Transit (Metro). Metro is a separate entity from the City. It operates 20 routes in the greater Kalamazoo metropolitan area, mostly serving the City center. In 2021, Metro kicked off a Comprehensive Operational Analysis to evaluate the system design and recommend improvements. Operational changes, such as offering more trip types, can increase ridership and help advance the goals of the CSP. The CSP does not have direct influence on the transit system, but the plan can serve as a conduit to bring partners and stakeholders together to work on shared goals.

Regional Planning

The Kalamazoo Area Transportation Study (KATS) and their 2045 Metropolitan Transportation Plan is the overarching driver for transportation funding and transit planning in our area. The transportation vision at the regional scale must balance many priorities for many users. KATS plan focuses on improving safety, security, reliability, and mobility of the system for people, freight, and services. Transportation improvements are designed to enhance both livability and sustainability. The work the City does to improve access and completeness of the local transportation

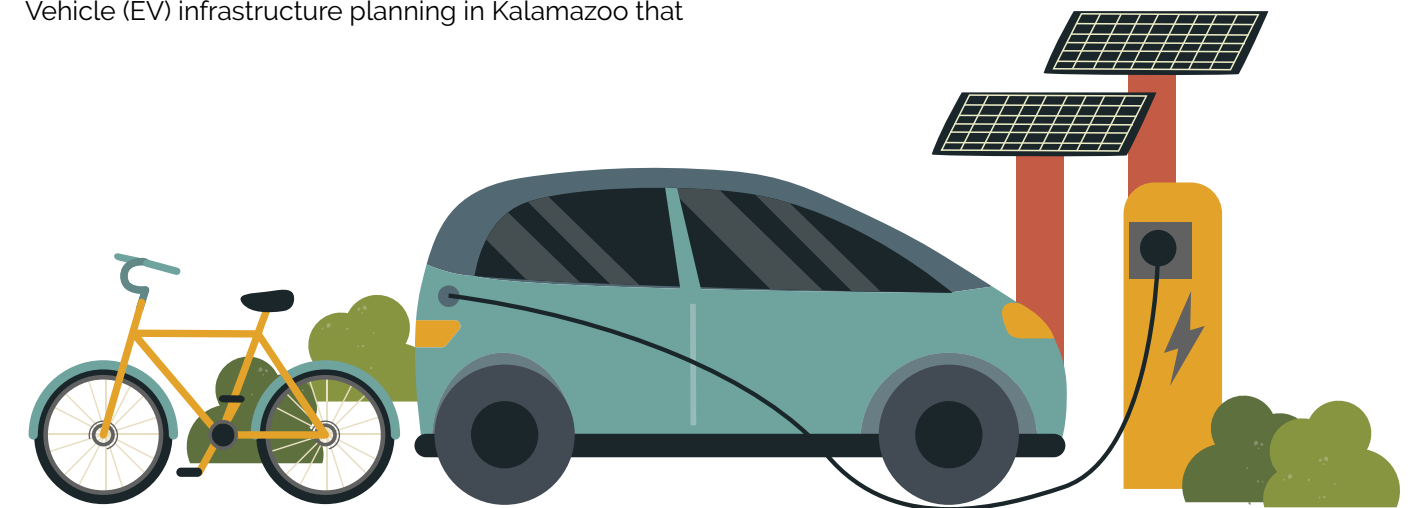
network must be done in collaboration with KATS.

Strategic Direction

The CSP builds from the Master Plan and other plans to center accessibility and completeness. It prioritizes elements of these plans to advance strategies for multi-modal, lower carbon, and green design elements within the transportation network.

To be accessible and complete, the transportation network must provide more choices for users. We must invest in public spaces and streetscapes that provide attractive alternatives, including active transportation modes like bicycling and walking. Making these modes feasible will also require new land use policies that work to increase density near nodes of activity or along well-connected corridors.

Smart design of the transportation network can also help us reduce carbon emissions and build community resilience. The CSP seeks to fill gaps in other City and regional plans where long-term funding for sustainable practices such as green stormwater infrastructure has not been identified. Similarly, we have an opportunity to guide Electric Vehicle (EV) infrastructure planning in Kalamazoo that



was not needed even a few years ago.

The strategic direction in the CSP used the following considerations:

- **Align with Connected Plans.** Leverage other plans and their momentum to accomplish the core objective for climate change mitigation: fewer vehicle miles and emissions from travel. This includes the 2025 Master Plan, Kalamazoo Area Transportation Study (KATS), Complete Streets Policy, Street Design Manual, and public transit plans
- **Make it Local.** Focus on what is within our local sphere of influence.
- **Fill Planning Gaps.** Prioritize strategies and actions that are not defined within other plans or work scopes. This includes things like forward-looking stormwater management and preparing for the transition to the Electric Vehicles (EVs).

The CSP places an emphasis on implementing and tracking progress toward sustainability-focused elements of the City's new Street Design Manual.

Goal: Design a greener transportation network that easily and safely connects all users to places they need to go

Ensure the non-motorized network is connected and accessible year-round

ACTIONS:

- Implement and improve the City's non-motorized plan
- Complete a network assessment for accessibility
- Evaluate and upgrade intersections for clearer connections and safety for all users around priority amenities
- Pilot a sidewalk clearing program
- Encourage, educate, & enforce clearing through engagement campaign

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

- COST:** \$ \$ \$ \$ \$

Design context sensitive streets safe for all modes of transportation

ACTIONS:

- Create and implement a traffic calming process
- Create street design guides to ensure context sensitive streets, enabling safer, more comfortable travel for all users

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

- COST:** \$ \$ \$ \$ \$

Increase EV charging infrastructure and ensure access is robust & equitable

ACTIONS:

- Add EV charging design elements to the Street Design Manual for downtown, commercial corridors, and neighborhoods where residents rely on street parking
- Accelerate investment in EV infrastructure through incentives, reducing barriers, and innovative public solutions

FEASIBILITY: Priority to Launch



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

- COST:** \$ \$ \$ \$ \$

Invest in resilient stormwater infrastructure

ACTIONS:

- Develop a stormwater master plan
- Create revenue sources to maintain stormwater system and increase GSI
- Pilot green stormwater infrastructure for a public streets project, prioritizing climate vulnerable areas
- Revise stormwater and wellhead policies and standards

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

- COST:** \$ \$ \$ \$ \$

Goal: Design a Greener Transportation Network

A greener transportation system is one that is safe and easy to use, connects people to the places they need to go, and leads to opportunities for all users. It must support diversity of transportation modes, reduce vehicle miles traveled and idled, and strive to be environmentally sensitive.

This goal re-focuses aspects of the 2025 Master Plan which calls for a Connected City and Complete Neighborhoods. To implement the Connected City and Complete Neighborhoods goals in the Master Plan, the City created a Street Design Manual. The manual guides context sensitive street design for projects within the public right-of-way. It shares goals and values with the CSP, including streets designed for:

- Pedestrian and bicycle comfort and safety
- Networking strategies that reduce vehicles miles traveled
- Accessibility for residents with limited mobility or who use mobility-aids to streets, sidewalks, and bus stops
- Better access to transit for a safer and more affordable City
- Green stormwater infrastructure and street trees for a more resilient community

The four strategies to accomplish this goal are described in the previous summary boxes. Progress toward some of these strategies will be done through IK2025 implementation and tracking, including miles of non-motorized network and streetscape improvements. Outcomes related to Electric Vehicle (EV) charging infrastructure and green stormwater infrastructure will be tracked through the CSP process.

STRATEGY

Ensure the Non-motorized Network is Connected and Accessible Year-round

Purpose

Bike trails and pedestrian infrastructure have been a major focus in the City and Kalamazoo region. Building on existing successes, this strategy calls for an updated non-motorized transportation plan in the City. The plan will include specific engagement with users of the non-motorized transportation network. It is important to understand their experiences to inform better and safer design. Safer intersections, varied bike infrastructure, more accessible walking paths, and filling in gaps in the sidewalk network will foster equitable access to every corner of the City.

Actions

Implement and improve the City's non-motorized plan. Elements of the non-motorized plan were updated as part of the City's 2025 Master Plan and KATS Non-motorized Plan. The Complete Streets Advisory Committee (CSAC) serves as a public advisory body. They will work with staff to implement

WHAT'S HAPPENING NOW?

Following Imagine Kalamazoo 2025, the City has undertaken more public infrastructure projects. They center on traffic calming, sidewalk network expansion and repair, and overall street improvement projects.

Sidewalk Improvements

In 2021, nearly 10 miles of sidewalk were repaired. An additional 4.1 miles in new bike lanes and 1.2 miles of shared use paths were installed, increasing the quality of existing assets and the network.



Safe Routes to School

Neighborhoods are partnering with the Safe Routes to School Program. This federal initiative creates opportunities to design and build infrastructure suited to youth and family's pedestrian commutes. It strives for more seamless connection to hub points like schools and daycare facilities.



Traffic Calming

Traffic calming is important to encourage safe non-motorized modes alongside the personal vehicle. It can help the most vulnerable gain access to the transportation network for daily needs.



non-motorized infrastructure into City work. A system will be created to evaluate and update elements of the non-motorized plan, especially focused on identifying conflict zones and highly frequented areas in the network.

Complete a network assessment for accessibility with disability advocates and partners. Working with partners like the Disability Network and CSAC, an assessment will be performed to inform City projects. The assessment will be used to educate the public on issues regarding accessibility.

Evaluate and upgrade intersections for clearer connections for all users around priority amenities. Develop a schedule for evaluating intersections prioritizing high frequency areas such as commercial and neighborhood corridors and routes to schools and other amenities. Incorporate high priority intersections into CIP. Implement improvements using the Street Design Manual, Master Plan, and KATS Non-motorized Plan.



Pilot a sidewalk clearing program. The four-season experience in Kalamazoo can be hard on infrastructure and users, especially during periods of heavy snow or rain and extreme cold or heat. Specific challenges in clearing snow and ice is one barrier for non-motorized use of the current network. The City will take action to design and test a snow and leaf litter clearing program for sidewalk and bike infrastructure. The focus will be on priority sidewalk clearing along highly utilized routes.

Encourage, educate, and enforce clearing through engagement campaign. Continue to advertise sidewalk clearing ordinance requirements for property owners. Use enforcement and other mechanisms to ensure safe and accessible sidewalks during all seasons.

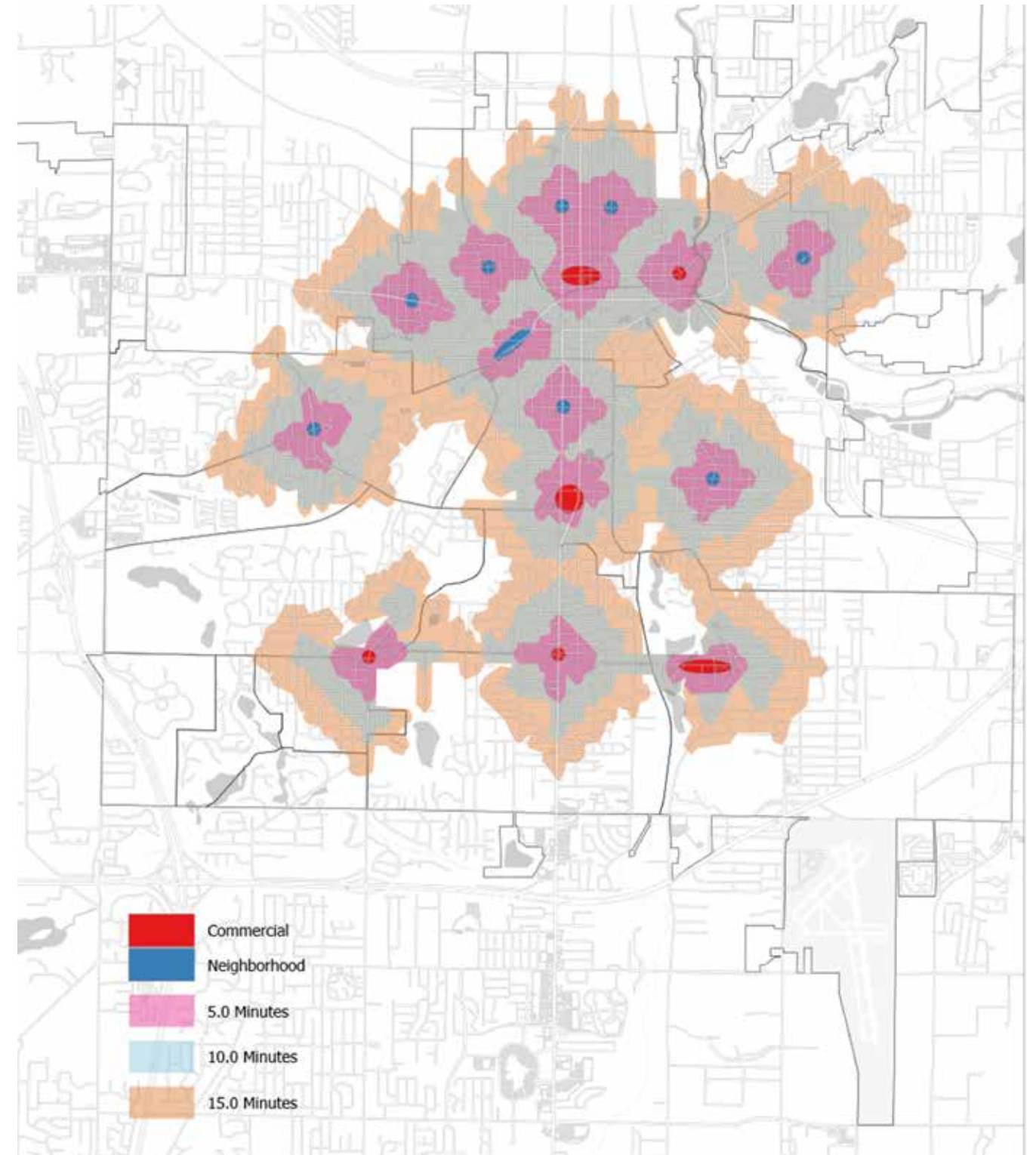
STRATEGY

Design Context Sensitive Streets Safe for all Modes of Transportation

Purpose

Our local streets should reflect the values of our neighborhoods and match surrounding uses (Smart Growth America, 2019). Context sensitive streets aim to reclaim public spaces within the transportation network. They are designed to connect a range of diverse people and places and create spaces suitable for walking, biking, riding and driving. For sustainability, well-designed streets can help drive a shift in mode share that reduces carbon emissions. The streetscape can be an opportunity for green space for environmental protection and community resilience.

Walking Map



Walking Map delineating 5, 10, and 15 minute walking zones from Neighborhood and Commercial Nodes. Nodes are from the IK 2025 Future Land-Use Map. Created by Author(s).

The Street Design Manual helps projects navigate the tough choices or trade-offs due to limited space in the right-of-way. For example, the manual can help make decisions like adding or reducing on-street parking, planting street trees, or adding bike lanes when all these things cannot fit. The Street Design Manual elevates opportunities for sustainability design or treatments that align with goals in the CSP. These recommendations include walkability, micro-mobility, green stormwater infrastructure, bicycle and bus stop infrastructure, and on-street parking elements.

Actions

Create and implement a traffic calming process.

Create asynchronous outreach service or tool to continually gather feedback on traffic calming projects and to improve implementation of calming tools and designs.

Implement the Street Design Manual to ensure context sensitive streets enabling safer, more equitable travel for all users.

Leverage the Street Design Manual and public-private partnerships to increase multi-modal opportunities and reduce vehicle miles traveled. Commercial and neighborhood nodes and corridors offer opportunities to promote alternatives to personal vehicles.

STRATEGY

Increase Electric Vehicle Charging Infrastructure and Ensure Access is Robust and Equitable

Purpose

Thoughtful planning and designs can help us integrate Electric Vehicle (EV) charging infrastructure into streetscapes, multi-family housing projects, and commercial spaces. One of the perceived barriers to EV adoption is the lack of charging points (PlugShare, 2021). We can help improve consumer confidence in Kalamazoo by supporting a robust charging network through ordinances and incentives.

Actions in the CSP include streamlining design and permitting, revising parking requirements, utilizing incentives, and partnering with utilities and state agencies to ensure adequate and equitable public

EQUITY GUIDE

Low- to moderate-income households can be priced out of EVs due to their higher initial purchase price compared to gasoline models. Voucher and instant rebate programs can help lower initial EV costs.

Areas that rely on street parking, housing units with shared parking, and parking lots and carports without electricity can present barriers for EV charging infrastructure and limit residents' practical access to EVs. Better building codes and innovative charging stations are needed to provide equal access.

access (Huether, 2021).

Actions

Add Electric Vehicle (EV) charging design elements to the Street Design Manual for downtown, commercial corridors, and neighborhoods where residents use on-street and shared parking.

The City must review and revise the zoning ordinance to ensure requirements allow for and optimize EV infrastructure. Incorporating EV charging design

elements into the Street Design Manual will help standardize and streamline EV charging in the public right-of-way. On-street parking provides an ideal opportunity for shared EV charging. The manual should address ways to streamline the experience for users, for example, avoiding multiple pay stations and long-term parking to increase availability.

Accelerate investment in EV infrastructure through incentives, reducing barriers, and innovative public-

KALAMAZOO'S STORM SEWER SYSTEM

The City owns a municipal separate storm sewer system (MS4) which is not connected to the sanitary sewer system. When it rains, the MS4 collects and discharges stormwater into the Kalamazoo River and local streams.

THE STORM SEWER SYSTEM

- 228 miles of stormwater drain
- 470 total outfalls to surface water
- 11,616 catch basins and inlets
- 4,670 manholes

The City has an active role in watershed and water quality protection. The City's stormwater ordinance requires public and private development projects to capture and treat stormwater before it

enters the MS4. This can be done by both green stormwater infrastructure (GSI), such as rain gardens, and traditional grey practices.

The City's Natural Features Protection (NFP) overlay district requires more stringent stormwater capture and treatment for sites located near sensitive natural features. Recognizing changing precipitation patterns due to climate change, it will be critical to monitor and amend the standards over time.

NFP has been a way to test more stringent standards to determine whether more robust treatment and GSI can be managed on-site in a cost-effective way.

private solutions. New development should be prepared for EV-readiness. Development projects seeking City incentives for residential housing need to consider EV-ready design whereby electric infrastructure is available to add EV chargers in the future (Ghamami et al., 2019; Huether, 2021). Public-private partnerships will be critical in retrofitting neighborhoods where residents rely on street parking or where renters cannot install 1:1 charging for personal vehicles (ElectrifyNY, 2021).

STRATEGY

Invest in Resilient Stormwater Infrastructure

Purpose

Kalamazoo is outgrowing its aging stormwater infrastructure. Climate change impacts are predicted to exacerbate challenges to an undersized system. Maintaining a system that can handle the increasing rainfall frequencies and intensities will be critical in the future. This will require targeted investment. Significant investment is necessary in both grey and green stormwater infrastructure (GSI).

The Street Design Manual includes stormwater management guidance for streets projects. The CSP can add value to guidance in the manual by focusing green stormwater infrastructure and street trees in neighborhoods with high imperviousness and urban heat island effect.

Actions

Develop a stormwater master plan. Knowing the condition of stormwater assets in the City, the next

important step in improving the MS4 is to develop a stormwater master plan. This plan will help identify long-term maintenance costs, priority areas for investment, and potential funding models.

Create revenue sources to maintain stormwater system and increase GSI. A major barrier to on-going stormwater maintenance and capacity is lack of dedicated funding sources. Currently, critical repairs and limited maintenance are funded from the City's general fund. Major investments in the system will require additional revenue sources. Communities in Michigan and across the Great Lakes Region are exploring a variety of revenue sources like stormwater utility fees, federal and state loan programs, public-private partnerships, and green bonds to replace broken funding models.

Pilot green stormwater infrastructure for a public streets project, prioritizing climate vulnerable areas. Use a GSI pilot project to determine cost differential, effectiveness, and long-term maintenance. Site selection should be based on climate vulnerability due to high imperviousness and urban heat island effect. Several neighborhood plans prioritize GSI for implementation within neighborhood goals.

Revise stormwater and wellhead policies and standards. To comply with permit requirements and protect surface and groundwater resources, the City has stormwater and wellhead protection ordinances. These ordinances require stormwater management for new and redeveloping sites. Standards will be updated to ensure surface and groundwater is protected from sources of contamination .

INCREASING RAINFALL IN KALAMAZOO

The Great Lakes region has experienced changes in the frequency, amount, and form of precipitation over the last 70 years. According to the Great Lakes Integrated Science Assessment (2020), much of the region is expected to experience more annual precipitation over this century .

CHANGES:

- Total rainfall volume in Kalamazoo has increased by over 24% since 1951
- Rainfall from extreme events, or the heaviest 1% of storms, has increased by 89%
- Additional two to six inches per year by the end of the 21st century

Climate models predict that these rainfall patterns will continue to change rapidly in the future due to higher carbon emissions and inherent feedback systems. The historic average (1981-2010) rainfall in Kalamazoo is just over 36 inches per year.

Mid-century projections show Kalamazoo could get between 37 to 42 inches annually, and late-century models predict 37-47 inches annually 10. Heavy precipitation days where we get over 1.25 inches of rain in a 24-hour period are anticipated to increase from 5 per year to over 8 days per year.

This change over time means our existing MS4 infrastructure will tend to be undersized for the storm it was designed to handle. Inadequate stormwater infrastructure causes drainage problems and localized flooding in heavy precipitation storms.



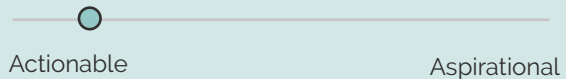
Goal: Strategically increase residential density to facilitate safe, accessible, and equitable travel

Encourage density for more sustainable land use

ACTIONS:

- Implement the City's housing strategy to maximize density and intensity in appropriate districts and nodes
- Encourage infill by allowing more housing units and types in different zoning districts
- Develop pre-approved plans for different housing types

FEASIBILITY: Priority to Launch



CITY ROLE:

- Act
- Connect
- Advocate

TIMELINE:

- Short
- Mid
- Long
- Extended

- COST: \$ \$ \$ \$ \$

Support development that helps people live closer to work and daily needs

ACTIONS:

- Tie density goals to targets that will support transit-oriented development
- Collaborate with large employers and institutions on home ownership opportunities near work
- Use incentives to support development near employment or public transit and that connects to daily needs

FEASIBILITY: Opportunistic



CITY ROLE:

- Act
- Connect
- Advocate

TIMELINE:

- Short
- Mid
- Long
- Extended

- COST: \$ \$ \$ \$ \$



Goal: Strategically Increase Residential Density to Facilitate Safe, Accessible, and Equitable Travel

Transportation and land use are inextricably linked. The 2025 Master Plan is the authority on the City's vision for integrating land use with context sensitive streets. This vision is communicated through the Future Land Use (FLU) map in the 2025 Master Plan. The City is realizing this vision by strategically updating the Zoning Ordinance to reflect simplified land use categories. This re-zoning embraces a more form-based code allowing flexibility in uses that are tied together by consistent building types and design standards.

Another priority from the 2025 Master Plan engagement process tied to zoning is more housing types and density, where appropriate. The "density" goal means better utilizing the limited land resources within the City. Zoning that allows residential units above commercial spaces is a great example of how we can increase density to be efficient with land and create vibrant, active spaces. Density must be targeted to areas that can support multi-modal transportation. And increased density will increase opportunities for and use of public transit and non-motorized transportation.

This goal aligns with aspects of the 2025 Master Plan which calls for Connected City and Great Neighborhoods. While the 2025 Master Plan works to encourage development that helps meet a variety of community needs, the CSP includes these strategies to capitalize on the environmental health and carbon benefits of connected neighborhoods. The CSP shares goals and values these aspects of Connected City and Great Neighborhoods:

- Enable density of housing types and intensities around commercial and neighborhood nodes
- Shape land use and zoning near centers of activity to encourage more multi-modal transportation and public transit



Strategies to accomplish this goal are described in the previous summary boxes. Progress toward these strategies will be done through IK2025 implementation and tracking. Outcomes related to these strategies will be reflected in the successful implementation of more active transportation opportunities and the long-range decrease in community carbon emissions.

STRATEGY

Encourage Density for More Sustainable Land Use

Purpose

Re-evaluating and updating the Zoning Ordinance is an ongoing priority for Kalamazoo. The recent additions of Live-Work 1 and 2 Zoning Districts create opportunities for more dense development that supports mixing uses and balancing surrounding character.

Updates to the Zoning Districts should encourage and support:

- Infill housing and multiple housing types within neighborhoods, especially within 15-minute walk to commercial and neighborhood nodes
- Allowing a mix of uses and mixed-use buildings within commercial and neighborhood nodes
- Zoning requirements that create opportunities for public infrastructure, improvements to sidewalks, and addition of bus stops to connect neighborhoods to nodes

Actions

Implement the City's housing strategy to maximize density and intensity in appropriate districts and

HOW DENSITY HELPS SUSTAINABILITY

Transit-Oriented Development (TOD) is designed to increase the number of residents, employees, and potential transit riders that have convenient access to transit (Minneapolis Metro Transit, 2021; MRSC, 2021)..

BENEFITS

- Less public infrastructure to install and maintain
- More transportation options at lower cost
- More affordable and efficient housing and buildings
- Less impervious surface when green space is incorporated into cities
- Lower carbon emissions per capita
- Vibrant urban culture and amenities

nodes. The City's Housing Strategy is guided by the 2025 Master Plan and centers affordability, infill strategy, and investment in historically disinvested neighborhoods. The plan will create an emphasis on density and location to amenities that will advance sustainability goals, as well as affordable housing goals.

Encourage infill by allowing more housing units and types in different zoning districts. Updates to the zoning ordinance over time will help increase density and infill by allowing a variety of opportunities in appropriate districts. For example, many areas of the City now allow accessory dwelling units by right.

Develop pre-approved plans for different housing types. This action will streamline the design review and permitting process for housing types in the "missing middle" (two to four-unit buildings). This streamlining will be used as a carrot to encourage more dwelling units on parcels that can support more density in the appropriate districts. The City can further incentivize infill housing by matching parcels to pre-approved plans and using funding sources to fill appraisal gaps. This strategy will be important in disinvested neighborhoods with a high number of vacant lots. The City and developers will need neighborhood involvement and leadership and draw guidance from neighborhood plans.

STRATEGY

Support Development that Helps People Live Closer to Work and Daily Needs

Purpose

Encouraging people to walk, bicycle, or use public

transit for transportation requires proximity, land use planning, infrastructure, and transit to align. Much of this is driven by the correct mix of residential density, intensity, and variety of commercial and mixed-uses (MRSC, 2021). The City has local influence over land use through zoning, which can support appropriate density and intensity.

The City uses financial development incentives to further leverage private investment within Kalamazoo.

EQUITY GUIDE

It is critical to recognize how new development can lead to unintended consequences. Steps must be taken to avoid pushing out residents from neighborhoods in which they have historical and cultural ties.

Leadership from neighborhood stakeholders can help create dialog that shapes projects to fit community needs. Neighborhood plans have helped create this space and solidify goals to shape future development. Community land trusts, limited equity cooperatives, and home ownership programs can keep communities intact while investment and infill development grow in the neighborhood.

These incentives can shape development patterns when funding programs align with strategies in the 2025 Master Plan and CSP.

Actions

Tie density goals to targets that will support transit-oriented development (TOD).

Begin to plan for and create the density needed to develop TOD. This planning will require collaboration with regional partners and stakeholders, including Metro Transit and KATS. Developing TOD can itself increase density and gives more access to public transit, providing more equitable options for all users. Projects similar to this are being piloted in Kalamazoo.

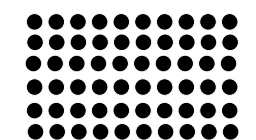
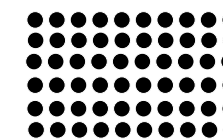
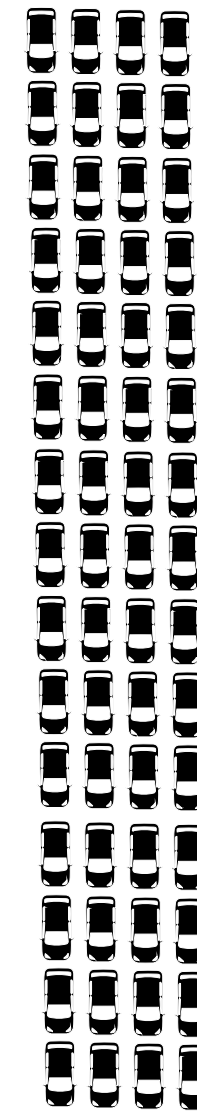
Collaborate with large employers and institutions on home ownership near work.

Work with major employers to understand staff needs and housing. Explore new or enhanced incentive structures to offer tax rebates or other sources of funding for neighborhood housing in proximity to employers. For example, a Neighborhood Enterprise Zone (NEZ) is an existing incentive for housing development in some parts of the City. Creation of new NEZ districts could be linked to major employers or new developments offering significant employment expansion.

Use incentives to support development near employment or public transit and that connects to daily needs.

Require project seeking public support through low-interest loans, grants, and tax increment financing to show how it reduces vehicle miles traveled by residents and employees. This could include proximity to employment and amenities, well connected non-motorized infrastructure, bicycle facilities, and public transit collaboration. These

incentive programs should prioritize development within historically disinvested neighborhoods. A secondary priority is for projects with a significant housing component near a major employer or centers of employment.



Space needed to move 60 people by car vs bus. Each dot represents one person (U.S. Dept. of Transportation, 2010).

Goal: Make transit a more viable option for more trip types and users

Invest in transit infrastructure to create more efficient, faster service

ACTIONS:

- Determine need, viability, and costs of infrastructure to improve on-time performance and prioritize high frequency routes
- Invest in bus shelter locations and solar lighting

FEASIBILITY: Horizon

—————○—————
Actionable Aspirational

CITY ROLE:

Act Connect **Advocate**

TIMELINE:

Short Mid Long **Extended**

COST: \$ \$ \$ \$ \$

Increase transit system reliability and availability

ACTIONS:

- Complete a Comprehensive Operational Analysis and implement system design improvements
- Develop new service types such as BRT or workforce transportation programs
- Pilot a micromobility project "employees on wheels" service working with employers

FEASIBILITY: Horizon

—————○—————
Actionable Aspirational

CITY ROLE:

Act Connect **Advocate**

TIMELINE:

Short Mid Long **Extended**

COST: \$ \$ \$ \$ \$



Goal: Make Public Transit a More Viable Option for More Trip Types and Users

For those in Kalamazoo who cannot or do not drive, public transit is essential. The city and Kalamazoo region have bus service provided by Metro. The system offers 20 bus routes with 750 bus stops. Metro currently operates routes on a 15-, 30-, and 60-minute routes in the City of Kalamazoo. Most of the routes start and end in downtown. In 2018, Metro provided over 2.8 million rides countywide. During the same period, 88% of passengers used the bus when they had no car and 66% do not have any other means of transportation.

Public transit is a sustainable transportation choice for many reasons. Moving people by bus is far more efficient and requires less transportation infrastructure. Public transit reduces traffic and street congestion, and the pollution associated with personal vehicles. It provides affordable, equitable access to transportation for more users.

The strategies for this goal are described in the previous summary boxes. Progress toward these strategies will primarily be tracked by Metro. Outcomes from these actions will contribute to long-range objectives like lower carbon emissions over time. This will be monitored through the CSP.

STRATEGY

Invest in Transit Infrastructure to Create More Efficient, Faster Service

Purpose

To increase more choice ridership in Kalamazoo, the bus system must be efficient, convenient, and fast.



MINNEAPOLIS MOBILITY HUB PILOTS

Minneapolis, MN has successfully piloted and sustained an innovative mobility hub system that acts as an intersection between transportation types allowing greater access to those who rely on public transportation, walking or bicycling (Rasp et al. 2019; Rasp et al., 2020). These mobility hubs also bridge divides between various socio-economic and demographic groups by supporting mobility hub ambassadors who help represent residents and aid in the use of the hub. Other organizations utilize hubs as spaces to assist others. For example, the library installed simple lockers with wintertime kits for those in need, residents dropped off food to assist those facing hunger and hubs even acted as locations for the temporarily unhoused to find shelter.

This type of initiative can bolster the resilience of a community, boost neighborhood participation and economic corridors, and create a modular system of enhanced wayfinding and activate public space, built in-part, with the help and feedback of users and residents. The resiliency of public spaces and systems like this can play a significant role in creating accessible and equitable options beyond private car ownership and provide an opportunity for unique placemaking (Rasp et al. 2019; Rasp et al., 2020).

Regional transportation planning and dense land use helps support an efficient bus system. With our current population and land use constraints, there are opportunities to improve infrastructure to optimize the bus system. For example, the Street Design Manual provides guidance on creating bus queue jump lanes. Buses can then bypass waiting traffic queues, significantly improving transit travel time.

In Kalamazoo, technology continues to improve the rider experience by giving information on where buses are located along a route and what bus serves a bus stop. This information is crucial for the regular user of the system, as well as those new to Kalamazoo.

Actions

Determine the need, viability, and cost of infrastructure to improve on-time performance and prioritize high frequency routes. Metro uses technology to monitor the on-time performance of routes and uses this to modify routes. Changes are made when impacts such as traffic congestion result in buses not being able to reach time points accurately or there is a consistent pattern of late buses. Once priorities or problem areas are identified, Metro will work with local partners like Kalamazoo's Public Works Department to find solutions like bus queue jump lanes to implement system improvements. Regional transportation planning will be important as many routes cross jurisdictional lines.

Continued improvements being explored by the transit system include live next bus information at the Kalamazoo Transportation Center and transfer hubs

throughout the system as well as micro-transit. These changes will allow modifications to bus schedules to be communicated to the community quickly. Frequent service will continue to be examined by Metro, including on high ridership routes that service commercial corridors such as Westnedge, Stadium Drive, West Main, and Gull Road.

Invest in bus shelter locations and solar lighting

Having a safe, convenient location for users to wait for a bus is key to a successful system. These factors, along with reliability, play into whether someone uses the bus on a regular basis or chooses to use a personal vehicle. Metro is committed to investing in infrastructure, such as bus shelters that provide seating to those waiting for a bus or those with limited mobility. Metro has been focusing on placing bus stop locations near existing lighting sources. Moving forward, Metro plans to install solar lighting inside shelters to provide security lighting for passengers using the system early in the morning or at night.

STRATEGY

Increase Transit System Reliability and Availability

Purpose

Metro's bus service routing through Kalamazoo is continuously reviewed based on economic growth, residential development, and expansion of schools and social-needs programs. Routes are evaluated when any of these areas are identified within Master Plans and as part of site plan reviews.

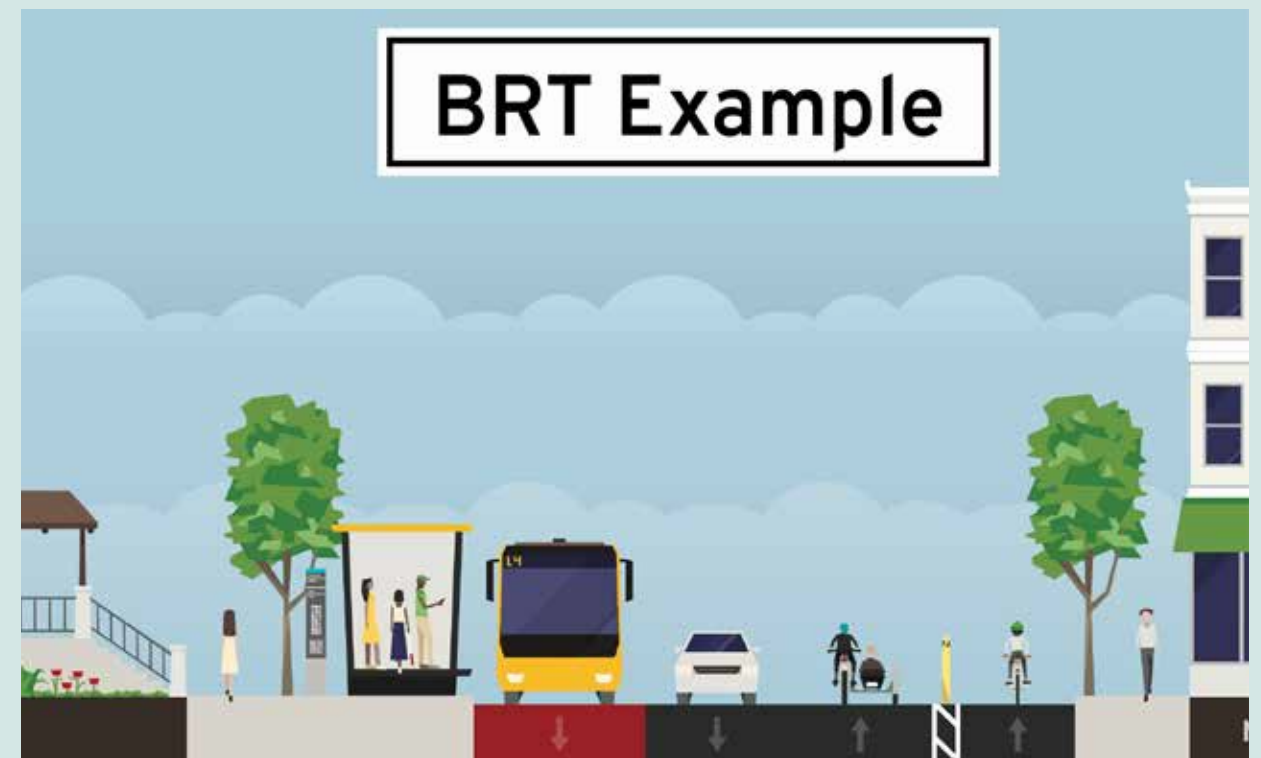
Metro continues to work with local employers and

TRANSIT-ORIENTED DEVELOPMENT

Transit-Oriented Development (TOD) is a planning approach that calls for high density, mixed-use neighborhood centers to be clustered around transit stations and corridors (Minneapolis Metro Transit, 2021; MRSC, 2021). For sustainability, this is a strategy for weening people off their dependency on personal vehicles.

Classically implemented using light rail train systems, it can also be put into practice using bus systems (Bust Rapid Transit or BRT) which is important for mid-size cities without large subway or train systems (The Rapid, 2021; City of Madison, 2021).

To support BRT, the density of residential dwelling units is important. It is recommended to have a minimum of 10 dwelling units per acre (DUA) and is optimal to have more than 20 dwelling units per acre within 1-2 blocks of a local bus station.



Made with StreetMix (Streetmix.net).

institutions to identify opportunities for work force and other transportation programs. For example, in 2021 Metro partnered with the City to create a youth mobility program. It gave high school students bus passes that instantly increased their mobility and provided a safe, reliable option to get to school.

Actions

Complete a Comprehensive Operational Analysis (COA) and implement system design improvements.

In 2010, Metro completed a COA that provided cost-neutral-, short-, and long-range plans for improving the transit system. Recommendations ranged from route adjustments to time points to improve on-time performance. Areas outside the current transit service area are also examined to determine how best to grow the system. Key items from the 2010 COA that were implemented included later evening and Sunday bus service, as well as service hour expansion for Metro Connect, Metro's demand response bus system that is available countywide by reservation.

Metro is undertaking a new COA. Once complete, implementing the recommendations from the COA is a priority for Metro. The updated analysis will undertake similar route reviews but will focus on new emerging transit technology and programs, including the feasibility of Bus Rapid Transit (BRT).

Develop new service types such as BRT or workforce transportation programs. Partnering with specific employers to offer shared transportation options for employees can help expand transit while providing economic opportunities and environmental co-benefits. It can also assist those lacking private

transportation, which can be an obstacle to finding work. Employers in Kalamazoo are regularly searching for ways to get employees to the job site. Metro is piloting micro-transit service to local employers with new partnerships. This partnership would allow those living in the City to take employment in the surrounding county that is outside the existing fixed route bus system.

Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT) is a transit system that utilizes bus-only lanes, traffic signal priority, limited stops, and offboard fare payment to increase speed and reliability as compared to a local bus service.

BRT systems have many of the same benefits of a light rail system - at a fraction of the cost. The City of Grand Rapids was the first in Michigan to institute a BRT system in 2014 (The Rapid, 2021). Within one year, ridership increased by 35%.

Source: www.rtamichigan.org



Pilot micro-mobility projects "employees on wheels" service working with employers. Some of Kalamazoo's Zoning Districts like Live-Work 1 and 2 provide opportunity for development that can coincide with micro-mobility projects. This type of development is found around major commercial corridors throughout the city and provides ample room to increase density and the ability to co-locate hubs that increase micro-mobility within the corridor while also connecting to the Metro bus network.



Affordable Efficient City

DECARBONIZING THE ENERGY SECTOR WILL REQUIRE BOLD ACTION BY UTILITIES, STATE REGULATORS, MUNICIPALITIES, AND CUSTOMERS. LOCAL ACTION WILL BE CRITICAL. IN KALAMAZOO, WE CAN SUPPORT MORE RENEWABLE ENERGY. OUR BUILDINGS CAN BECOME SAFER, COMFORTABLE, AND MORE AFFORDABLE WHILE IMPROVING THE QUALITY OF AIR WE BREATHE.

In 2019, the transportation and energy sectors were the two largest carbon emitters making up 29% and 25% of U.S. carbon emissions, respectively. Commercial and residential buildings alone accounted for around 13% of U.S. carbon emissions (EPA, 2021).

This plan envisions a future where Kalamazoo gets its energy from clean, renewable sources that are affordable and reliable. Our work will involve making buildings more efficient and switching natural gas with electric systems. The desired outcome is a net-zero carbon city by mid-century with special attention to energy justice.

To achieve this sustainability vision, three goals have been set forth:

- Accelerate local renewable energy investments
- Transform building energy use to be more efficient, affordable, and cleaner
- Decrease emissions from vehicles, heavy equipment, and infrastructure

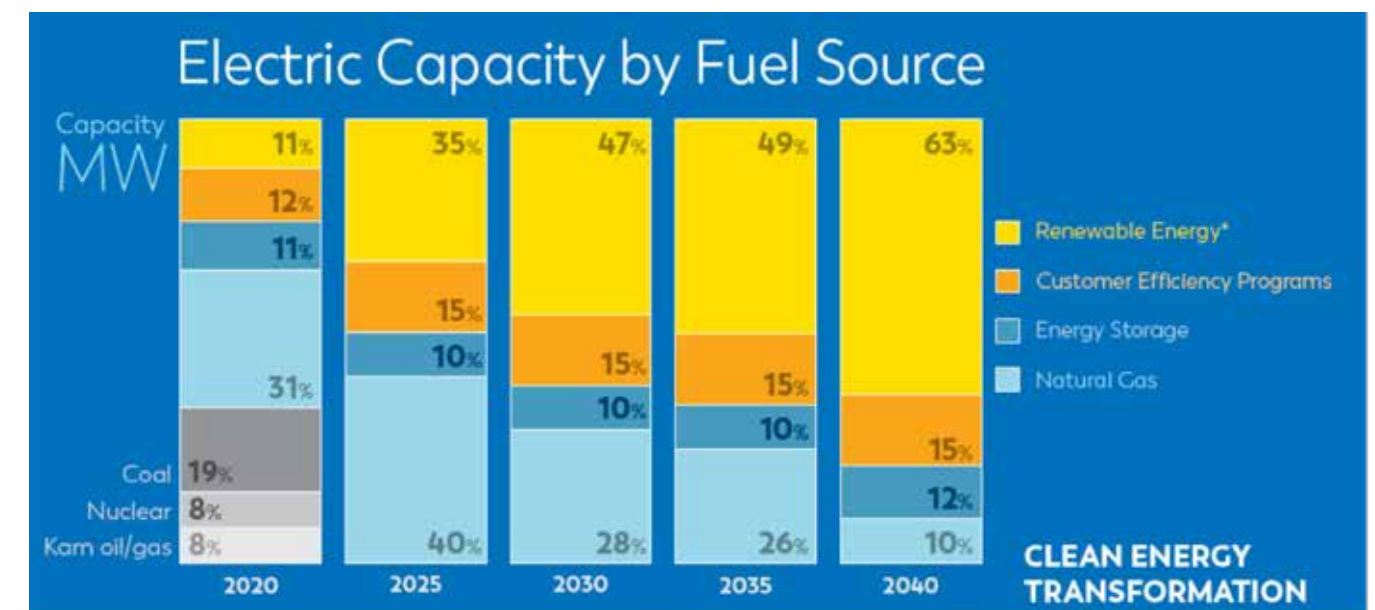
Introduction

In 2019, Kalamazoo-area residents and businesses spent over \$47 million on electricity and \$24 million on natural gas utility bills. The City's most recent Impediments to Fair Housing Report found long-term affordability is hindered by the high cost of utility bills in Kalamazoo. The Community Sustainability Plan (CSP) responds to community needs with goals and strategies that center affordability and clean energy. The strategies are designed to increase the amount of energy efficient buildings and renewable energy in Kalamazoo. This starts with City buildings, facilities, and vehicles.

Understanding Energy in Kalamazoo

Most buildings in Kalamazoo use electricity and gas from a private utility company. Some large institutions and industries generate their own power from local power plants. Western Michigan University is one example. The campus is powered by electricity generated from their own natural gas power plant.

Consumers Energy is the utility company servicing Kalamazoo, including all City-owned buildings, facilities, and street lighting network. In 2021, Consumers Energy made a sweeping proposal to eliminate their coal burning power plants by 2025. The utility committed to net zero carbon emissions by 2040, with over 60% of its power generation coming from renewable sources. The graph below shows the electricity production by fuel source anticipated by 2040.



Consumers Energy's Clean Energy Plan will remove all coal from the electric grid by 2025.

This change will mean less carbon emissions coming from the electricity used to power buildings in Kalamazoo.

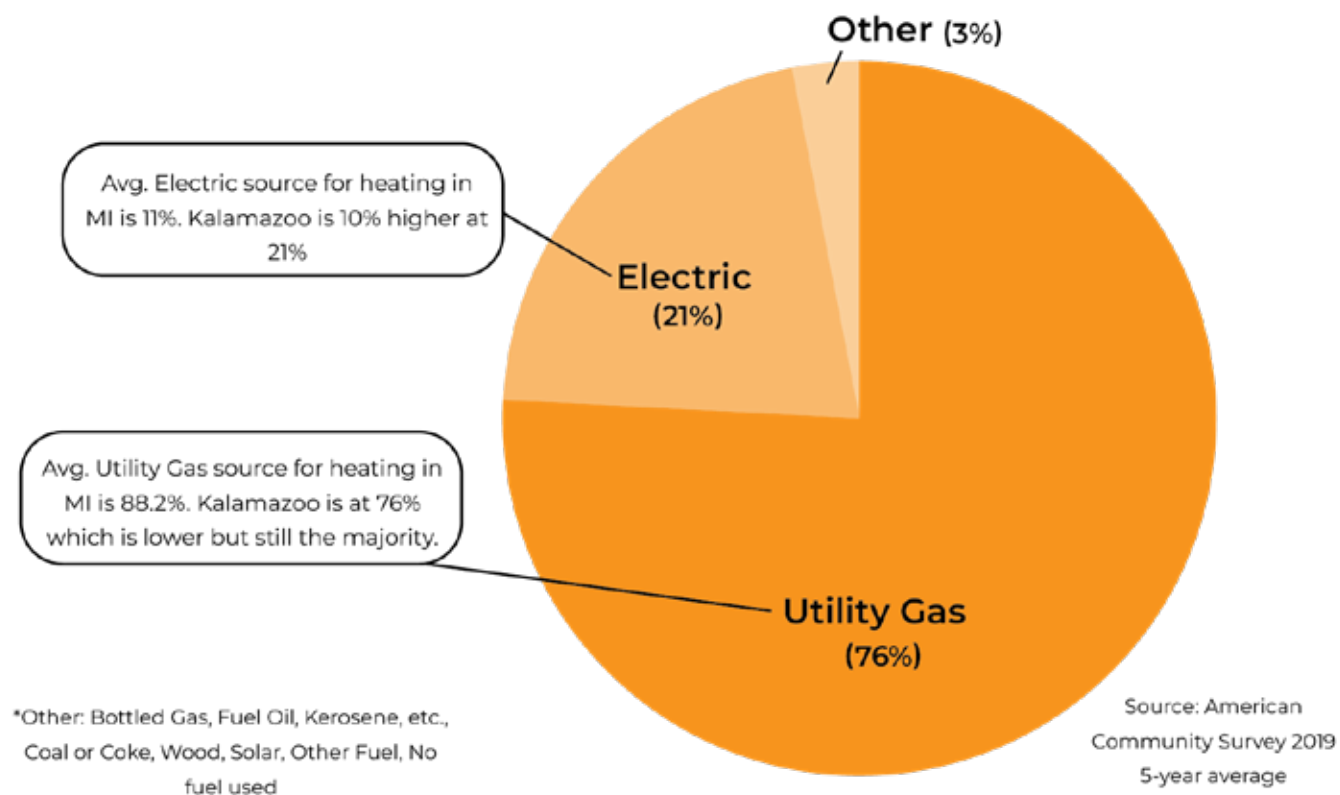
Similar to electricity, most customers in Kalamazoo have natural gas supplied by Consumers Energy. It is the preferred fuel source for home heating in our region and is commonly used for water heating, cooking, and other appliances (U.S. Department of Energy, 2014). In Kalamazoo, over 75% of homes use natural gas for home heating (ACS, 2019a). Natural gas furnaces vent carbon emissions at each building, increasing our local emissions and air pollution that

can lead to respiratory illness (Lin et al., 2013a).

Local, on-site renewable energy is growing in popularity but still lags conventional sources of power. Rooftop solar panels are one example of on-site renewable energy. Installing solar PV on a home or business can lower overall energy costs, especially after tax rebates are factored in (Higgins et al., 2021). Unused solar energy is fed back to the electric grid and the customer receives credits that reduce their utility bill.

Strategic Direction

CITY OF KALAMAZOO HOME HEATING SOURCES FOR OCCUPIED HOUSING UNITS



This chapter centers energy and equity so that all Kalamazooans can have comfortable, safe, and affordable buildings and homes. For energy to be sustainable, it must be reliable, affordable, and clean. The strategies in this chapter prioritize carbon reductions while considering affordability.

The strategies and actions in this chapter connect most closely with housing affordability in the 2025 Master Plan. Many of the strategies are new and not part of other City plans. The chapter references several new strategic plans or policies the City will develop and adopt to meet sustainability goals.

The strategic direction in the CSP was determined using the following considerations:

- **Reducing energy waste is the first, easiest step.** We must take action to reduce the amount of energy that is wasted through leaking building envelopes and inefficient appliances and lighting. It is especially important to reduce energy usage during periods when demand is high.
- **Local renewable energy is needed to meet our goals, and it must be accessible to everyone.** As private utility companies clean up the electric energy grid, we can do our part by supporting more renewable energy investment in Kalamazoo. We must work on barriers to affordability at the same time.
- **Buildings and vehicles must be powered by cleaner fuel sources.** Even with the current electric grid, switching vehicles from gasoline and diesel to electricity saves carbon emissions

Over the last 20 years, the electricity sector in the U.S. reduced its total carbon emissions from fuels it burns by 33%, and power utilities are committing to an even cleaner electric power grid in the future. (EPA, 2020)

and reduces local pollution. Changing home heating to electric will save emissions but the most benefit will be seen after 2025 and 2040 when coal is removed from the grid and natural gas is reduced. Pairing building electrification with renewable energy provides the best outcome: instant decarbonization (Griffith and Calisch, 2020).

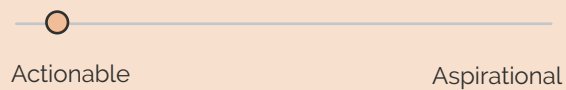
Goal: Accelerate local renewable energy investments

Remove barriers and develop tools that lead to more solar deployment

ACTIONS:

- Convene an internal team to evaluate, amend, and test codes and ordinances to create a streamlined development and permitting process (e.g., SolSmart)
- Convene an inclusive solar accelerator committee to develop decision-support tools (e.g., suitability assessment, map, guides)

FEASIBILITY: Priority to Launch



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Create partnerships to offer LMI-specific incentives for equitable solar deployment

ACTIONS:

- Actively participate in the EWR low-income workgroup and create local and regional partnerships
- Leverage funding sources to create a framework for solar deployment in LMI households

FEASIBILITY: Priority to Launch



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Pilot a community solar project

ACTIONS:

- Develop a community solar project as a local modes to address energy equity and affordability
- Join peer communities in Michigan to advocate for state policy that advances community solar and energy equity

FEASIBILITY: Priority to Launch



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Goal: Accelerate Local Renewable Energy Investments

The energy landscape is changing (U.S. Department of Solar Energy Technologies, 2020; Pierce and Sommerfeldt, 2021). Solar and other renewables are trending toward a low levelized cost when compared to fossil fuels (Lazard, 2019). In the future, solar will become one of the most affordable sources of energy (Gonzalez, 2021). Renewable energy gives us the opportunity to make energy in Kalamazoo cleaner, local, and more affordable. It provides a tool to address the unequal energy costs borne by some of the most marginalized in our community.

Strategies in the CSP focus on solar energy as the most suitable source of renewable energy in

Kalamazoo. Renewable energy models predict which technologies can produce the most energy in a certain place. In Kalamazoo County, models show these three types as the most promising (NREL, 2021):

- Large-scale solar photovoltaic (PV)
- Distributed and land-based wind
- Commercial and residential PV

Large-scale PV and land-based wind both favor large, open tracts of land. Development of these technologies is more suited for areas outside of the City. This leaves commercial and residential rooftop PV as an ideal renewable energy source in Kalamazoo.

There are unique opportunities for solar energy in Kalamazoo that will be examined through strategies and actions in the CSP:

- **Commercial and Industrial Buildings.** City government, industries, institutions, and private

developers own and operate over 140 large buildings in the City. Rooftop solar arrays on commercial and industrial buildings offer a good opportunity for local electricity production.

- **Residential Homes.** With over 36,000 housing units in Kalamazoo, there is ample opportunity for rooftop PV in many neighborhoods. Areas of the City with low tree canopy cover may be ideally suited for rooftop solar.
- **Landfills, Brownfields, and Other Public Land.** While large, open tracts of land are not abundant in the City, Kalamazoo has some unique, underutilized land. Landfills, brownfields, and other public open space could find a higher use by incorporating solar arrays.

While focused on solar energy, the strategies and actions in this chapter are designed to be flexible. They can be used with other renewable energy technology as new opportunities arise. The CSP recognizes that solar energy is not ideally suited for all buildings in all places. The strategy summarized

below describe actions that will help determine where best to invest and how to support residents, businesses, and solar developers to accelerate renewables in Kalamazoo. Outcomes from these strategies will be tracked in terms of renewable energy installations and climate benefits.

STRATEGY

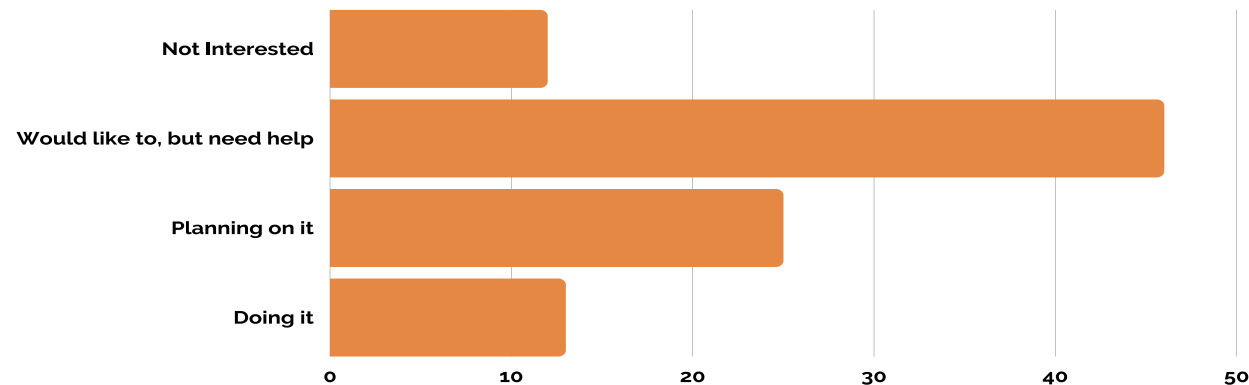
Remove Barriers and Develop Tools that Lead to More Solar Deployment

Purpose

The purpose of this strategy is to make it faster, easier, and more affordable to go solar in Kalamazoo. The CSP calls for actions that address local barriers to solar energy and foster the growth of mature local solar markets to our region. We seek to bring new business to Kalamazoo, promote economic growth, and foster the creation of new jobs.

Use renewable energy at home or business

96% response rate



Responses from the City's Community Sustainability Survey showed that almost half of the respondents (46%, n=266) are interested in using renewable energy at home but would not be able to do it without help. Furthermore, studies show that selling solar on the cost savings alone does not increase household adoption (NREL, 2018). The following actions will give residents, building-owners, and solar developers more information, tools, and access to solar PV.

Actions

Convene an internal team to evaluate, amend, and test codes and ordinances to create a streamlined development and permitting process. Installing a rooftop PV system triggers zoning, building, and fire codes and other ordinances. The City will evaluate various regulatory and permitting processes and recommend changes. Codes should clearly allow renewable energy by right, where appropriate, and indicate when site plan review is required. Maximizing the allowable panels and streamlining permitting is key to reduce barriers (U.S. Department of Energy, 2020). This action will focus on steps to encourage solar development in the right places, as well. Community engagement will help affirm which uses are compatible with different renewable technologies. The objective is to ensure Kalamazoo is "open to solar business" in ways that benefit neighborhoods and businesses.

Convene an inclusive solar accelerator committee to develop decision-support tools. This action starts with assembling a committee inclusive of stakeholders across the community. A special focus will be given to LMI and BIPOC communities to give

solar access to those traditionally marginalized. The committee will be charged with leading a community-wide solar assessment.

This assessment will show building- and parcel-level PV generation potential. It will include City government owned property. Results will help identify priority areas and project opportunities. Decision-support materials like a solar atlas, cost models, financing resources, and permitting guides will be developed for the public. The committee will consider strategies to increase solar development and create local green jobs.

STRATEGY

Create Partnerships to Offer LMI-specific Incentives for Equitable Solar Deployment

Purpose

This strategy is designed to make solar PV accessible to more people and address issues of energy justice (Zero Cities Project, 2018). Not all neighborhoods are invested in equally when it comes to renewable



energy. LMI communities are far less likely to have access to renewable energy. These households are not extended the opportunity to save on energy costs in the future. To ensure energy equity as the renewable market grows, the City will engage with statewide and local partners to create LMI-focused incentives for equitable solar deployment.

Actions

Actively participate in the EWR low-income workgroup and create local and regional partnerships. The Energy Waste Reduction (EWR) initiative is led by the Michigan Public Services Commission (2021a, 2021b). The statewide effort brings together energy utilities and stakeholders to implement renewable energy and efficiency goals. The EWR low-income workgroup identifies and addresses income-specific energy issues and creates new programs to reduce energy burden. The City will participate in the workgroup to elevate Kalamazoo's concerns. It will allow the City to gain experience from peer communities on how to better serve LMI households.

Leverage funding sources to create a framework for solar deployment in LMI households. In 2021, the Kalamazoo Attainable Homes Program piloted rooftop solar PV at four new construction homes. The systems were designed to offset electric utility bills to help maintain affordability. Building from this experience, the City will join with other partners to create a framework for more solar deployment. The program will focus on solar PV investments in historically disinvested neighborhoods for LMI households.

EQUITY GUIDE

A study in the U.S. found that low- to moderate- income (LMI) households are less likely to adopt solar than higher-income ones. The study by Lawrence Berkley National Laboratory found that households earning more than \$200,000 per year were four times more likely to adopt rooftop solar than households making less than \$50,000 (O'Shaughnessy, 2022).

This highlights potential energy justice issues:

- **Left out of capital gains.** LMI households are denied opportunity to benefit from the long-term financial returns that solar PV investment offers.
- **Paying more for less.** As solar takes over more of the market share, gas and electric from utility provides could be more volatile in price. This could mean non-PV households end up paying more for energy over time compared to PV households.

STRATEGY

Pilot a Community Solar Project

Purpose

The purpose of this strategy is to evaluate and put into action a community solar project. This type of project will allow more people to access the benefits of solar PV. This action can accelerate solar PV adoption as "spillover" occurs and people see how they can participate in the renewable energy market. It will also serve as a signal to the state and utility providers that local communities need tools like community solar to reach sustainability goals.

Community solar is a promising tool that can help overcome physical limitations and financial barriers. In a community solar program, the solar PV system is installed somewhere off-site in a larger commercial or utility-scale project. Electricity from the project is fed back into the grid instead of directly to a property or home. The community solar subscribers receive a credit on their utility bill for the power produced from the project. The State recently completed a community solar project to address roadblocks LMI households face in adopting renewable energy (Donalds, 2020). While there is no state legislation to support true community solar, a project can be done with the participation of a local electric utility.

Actions

Pilot a community solar project. The City will work with the solar accelerator committee to evaluate and identify a location for solar PV development.

As with other models in Michigan, the project will need to secure funding support for the project. The committee will work with other community-based organizations and initiatives to connect the project with green job training opportunities. For example, elements of this pilot project align well with Shared Prosperity Kalamazoo objectives.

Join peer communities in Michigan to advocate for state policy that advances community solar and energy equity. The City will lobby along with other peer communities for the State legislature's adoption of policies to support community solar and other innovative approaches. There are several policy frameworks that are lacking or need updating in Michigan, including virtual net metering, community choice aggregation, and increasing the distributed generation cap for solar (Misbrener, 2021).

Community Solar Program

In a community solar program, the solar PV system is installed somewhere off-site in a larger commercial or utility-scale project. Electricity from the project is fed back into the grid instead of directly to a property or home.

The community solar subscribers receive a credit on their utility bill for the power produced from the project.

BARRIERS TO SOLAR ADOPTION

Initial Investment Cost Is High

While solar saves households money over time, the initial investment is high and the return period long. This makes PV practically inaccessible for those who cannot or do not want to stay in their home long-term and for renters who do not own the home (Donalds, 2020).

Most Households Must Borrow Money To Afford Solar.

For households without capital or creditworthiness, getting a loan for solar is out of reach. This makes PV inaccessible for many households (Donalds, 2020).

Not All Properties Are Well-Suited For Solar.

Certain conditions make solar a better option for some homes more than others. Roof size, orientation, and condition and shading or technical

ACTIONABLE SOLUTION

Community Solar Can Help Overcome Many Barriers To Solar PV Adoption (Donalds, 2020):

- Member does not need a permanent rooftop with ideal conditions to benefit from solar. They are leasing panels from the project and can move their residence as much as they want.
- There is no upfront capital cost and financing is not needed. Members lease solar panels in the project instead of buying them outright.
- When leasing rates are lower than the energy credits generated by the project, the member sees an immediate gain.

Goal: Transform buildings and behavior to save energy and money

Retrofit and weatherize existing buildings to reduce energy waste

ACTIONS:

- Create a robust green affordable housing initiative)
- Improve commercial building performance through energy benchmarking and labeling programs
- Benchmark City buildings and develop an energy management plan

FEASIBILITY: Priority to Launch



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Electrify new and existing buildings

ACTIONS:

- Promote all-electric incentives for new construction, leading with City-supported projects
- Pair electrification with rooftop PV
- Advocate for better state building codes for energy and educate the community about electrification

FEASIBILITY: Opportunistic



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

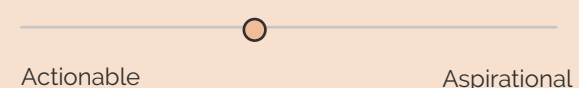
COST: \$ \$ \$ \$ \$

Encourage less energy use during peak demand periods

ACTIONS:

- Continue to implement the City's wastewater treatment plant demand response plan
- Encourage energy awareness and waste reduction in City offices and facilities

FEASIBILITY: Priority to Launch



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Goal: Transform Buildings and Behavior to Save Energy and Money

Home heating systems and appliances that use natural gas create carbon emissions in the City. These systems need to be converted or replaced with cleaner energy sources to reach the goal of net zero carbon. A strategy gaining momentum across the U.S. is to electrify these systems to avoid the negative impacts from burning fossil fuels. Electrification not only reduces carbon emissions, it also reduces harmful air pollution in our homes and communities (Griffith and Calisch, 2020).

With the evolution of heating technology, we have enjoyed more efficient, safer, and comfortable homes and greatly reduced air pollution. The 21st century will most likely be marked by the conversion to electric space and water heating to take advantage of a cleaner energy grid and renewables (Billimoria et al., 2018). This goal focuses on the need to transform buildings and behavior to take advantage of new technology that reduces energy waste and uses cleaner energy.



For every dollar spent on energy efficiency programs, customers will save around \$4 in avoided energy costs (MPSC, 2021a, 2021b).

STRATEGY

Retrofit and Weatherize Existing Buildings to Reduce Energy Waste

Purpose

Weatherizing buildings to be more energy efficient is an easy and low-cost way to lower carbon emissions. The amount of insulation and air sealing in a building's envelop, which includes walls, roof, and foundation, makes a big impact on the amount of money and energy it takes to keep it comfortable in cold winter and hot summer months. Home space heating and cooling make up about half of a residential utility bill (U.S. Energy Information Administration, 2015).

Kalamazoo boasts a variety of housing types and styles across the City's 21 neighborhoods and five historic districts. Over a quarter of all housing in Kalamazoo was built in 1939 or earlier (ACS, 2019). Homes build during this timeframe did not always include wall insulation or basic weatherization practices.

Actions

Create a robust green affordable housing initiative. Community partners and the City continue to advance efforts toward fair and affordable housing in

Tracking 350,000 buildings, U.S. EPA (Energy Star, 2012) found buildings that benchmarked using the Energy Star Portfolio Manager decreased energy use by an average of 2.4% each year simply by measuring and improving operations.

BUILDINGS & ENERGY EFFICIENCY



BUILDING CODES

In Michigan, all building codes are set by the State. Michigan has not updated its building energy code since 2015. Adopting the 2021 International Energy Conservation Code would result in buildings that use less energy and get more of their energy from electricity than gas.

Without changes to the energy code, all new buildings would essentially "lock in" higher levels of carbon emissions for many decades. Systems in these homes will not be replaced in the critical 10- to 15-year timeframe to avoid the most negative impacts of climate change.



ZERO ENERGY READY

Zero energy buildings look like regular buildings but have mechanical systems and construction technology that make them high performing and ultra-energy efficient. They are called "net zero energy" or "zero energy" because they consume as much energy as they produce from on-site renewables.

Zero energy "ready" refers to a design that sets up a building to be easily retrofitted to zero energy in the future. For example, a home can be built with electrical infrastructure that will allow easy connection of rooftop solar in the future.



WEATHERIZATION BARRIERS

The upfront investment can be significant, even if the long-term returns in lower utility bills are positive. Other critical repairs or more aesthetic home improvements can dissuade investment in energy efficiency.

Rental homes face some of the largest challenges. Since tenants typically pay utility bills, there is little financial incentive for the landlord to invest in energy efficiency upgrades



HEALTH RISKS

Gas appliances like stoves are the primary source of combustion pollution in a home. In comparison to electric stoves, gas models can have 50 to 400 percent higher average nitrogen dioxide levels (Weiwei et al., 2013).

Children are at high risk of health impacts from indoor combustion. A study found that children in homes with gas stoves have a 42 percent increased risk of asthma symptoms and a 24 percent increased risk of being diagnosed with asthma than children living in homes with electric stoves (Lin et al., 2013a).

Kalamazoo. The Housing for All initiative has increased quality affordable housing in Kalamazoo. Adding a "Green for All" policy component to the City's housing efforts will ensure environmental sustainability along with affordability. The City will create a framework for green building standards or ratings on all projects supported with public funding. These buildings will be models in the community for sustainable development.

Improve commercial building performance through energy benchmarking and labeling programs. There

are over 140 buildings in Kalamazoo that are 20,000 square feet or larger. They represent over 9.2 million square foot of building space. The City will continue to work with Consumers Energy and community stakeholders to implement a voluntary building energy benchmarking program for large building owners. The program will track energy use and give recognition for energy efficiency improvements. The City will work with partners to promote funding programs and incentives to help buildings make even deeper energy cuts.

HOME ENERGY SAVINGS OUT OF REACH

Not all households have access to energy savings. Weatherization projects require money or the ability to borrow.

The University of Michigan Urban Energy Justice Lab published a study of what is called the "energy efficiency financing coverage gap" (Forrester and Reames, 2020).

This gap represents households that are at or slightly above 200% of federal poverty level (FPL), thereby not qualifying for government weatherization programs. At the same time these households often do not meet the creditworthiness requirements of loan programs.

There is an energy efficiency financing coverage gap in Kalamazoo:

- **Access to Aid** - 35% likely to qualify for federal aid
- **Access to Financing** - 45% likely to qualify for traditional financing.
- **Gap** - 20% of households fall within the financing coverage gap

For comparison, statewide about 12% of households falls within the financing coverage gap.

EQUITY GUIDE

Energy burden is an important consideration for any green housing strategy (ACEEE, 2020; Elevate Energy, 2017 ;Gill, 2018). In Kalamazoo, the City's recent Impediments to Fair Housing study identified high utility bills as one long-term barrier to affordable housing.

A household is considered burdened when 6% of household income goes to utility bills. A severe energy burden is when more than 10% household income goes to utility bills.

Studies have shown that inequality in utility bills is not based only on household income.

In the U.S., black, Hispanic, and Native American household energy burden is **43, 20, and 45 percent higher** than that of their white, non-Hispanic counterparts, respectively (Drehobl et al., 2020). The same study found that the energy burden of older adults (65+) is 36 percent higher than the median household energy burden.

Benchmark City Buildings and Develop an Energy Management Plan. The City operates approximately 328,000 sf of commercial space used primarily as office, operations, and maintenance space. The water reclamation plant is over 31 acres of land with various buildings housing industrial processes. The City has over 36,000 sf of smaller buildings for recreation and drinking water facilities, which average less than 1,400 sf each. The City will complete a building stock assessment with energy audits on City-owned facilities. This information will be used to develop an energy management plan. Energy efficiency improvements will require funding from a combination of state grants, foundations, and the Capital Improvement Program.

STRATEGY

Electrify New and Existing Buildings

Purpose

Seventy-six percent of households in Kalamazoo use natural gas to heat their homes and around 20% use electricity. Over the next two decades we seek to flip these numbers, where most homes are heated with electricity. One of the biggest challenges to electrification is the cost or reputation of electric heating.

The purpose of this strategy is to target electrification when it makes economic sense. The switch to all-electric saves carbon emissions once the electric grid is cleaner or if a resident installs solar PV. For the Kalamazoo Attainable Homes project, rooftop solar PV was paired with electrification to offset higher utility bills of an all-electric home. The CSP recommends a similar strategy. Where environmental

and financial gains can be made, the switch to all-electric will be encouraged through City incentives and financing options.

Actions

Promote all-electric incentives for new construction, leading with City-supported projects.

Utility providers like Consumers Energy offer a variety of rebates and incentives to encourage net-zero building design like electrification. These programs would benefit from added local support through promoting and pairing funding. The City will develop a policy framework to incentivize all-electric construction on housing projects supported with City or public funds.

Pair electrification with rooftop PV. The utility bill cost savings from rooftop PV can help offset the additional cost of electric HVAC. A study in northern Michigan showed that pairing solar PV systems with electric HVAC systems (air source heat pumps) in northern U.S. climates yielded a 1.9% return on investment, outperforming the average savings account (Pearce J. & Sommerfeldt, 2021). Many of the new construction homes built by local nonprofits are using net-zero practices and installing electric HVAC. Most of these homes are PV-ready but do not include installation of solar PV. Using grants, innovative financing, and community solar, the City will support low-income households conversion to electric with solar PV.

Advocate for better state building codes for energy and educate the community about electrification.

The State of Michigan controls building codes and inspections and approvals are done through local

MIDWEST EXAMPLE OF DIFFERENT HOME HEATING AND COOLING TECHNOLOGY COSTS

(thousand \$, 15-year net present cost)

The cost to electrify a home depends on several factors, such as new construction versus retrofit, climate and weather patterns, and fuel pricing (Billimoria et al., 2018). The graph shows a cost comparison of economic scenarios in Chicago for electrifying homes. The technologies include a standard electric heat pump that heats and cools, natural gas furnace paired with existing AC, and natural gas furnace where a new AC unit was installed.

New construction homes: the cost of installing an electric heat pump was lower than a natural gas furnace and electric air conditioner (AC).

Retrofit home projects: replacing an existing gas furnace or water heater with an electric model was not cost effective over the life of the product.

For residents needing to replace both furnace and AC at the same time, the cost for electric heat pumps is becoming competitive with natural gas models since the electric unit can both heat and cool a home.



From the Rocky Mountain Institute (RMI), 2018.

Weatherization Focus Areas

Neighborhoods with high cost burden for housing, including energy bills, will benefit from green housing programs. These programs help remove environmental hazards from older homes and some energy improvements can increase home value.

*If powered by inefficient baseboard electric heat, conversion to heat pump would provide significant savings.

EASTSIDE (Census Tract 1)

- Total units: 990
- Constructed before 1940: 45%
- Valued at less than \$50,000: 42%
- Owner-occupied units cost burdened: 44%
- Renter-occupied units cost burdened: 63%
- Powered by natural gas: 81%
- Powered by electric only: <10%

EDISON (Census Tract 9)

- Total units: 502
- Constructed before 1940: 67%
- Valued at less than \$50,000: 57%
- Owner-occupied units cost burdened: 50%
- Renter-occupied units cost burdened: 54%
- Powered by natural gas: 71%
- Powered by electric only: 6%

KNOLLWOOD (Census Tract 15.7)

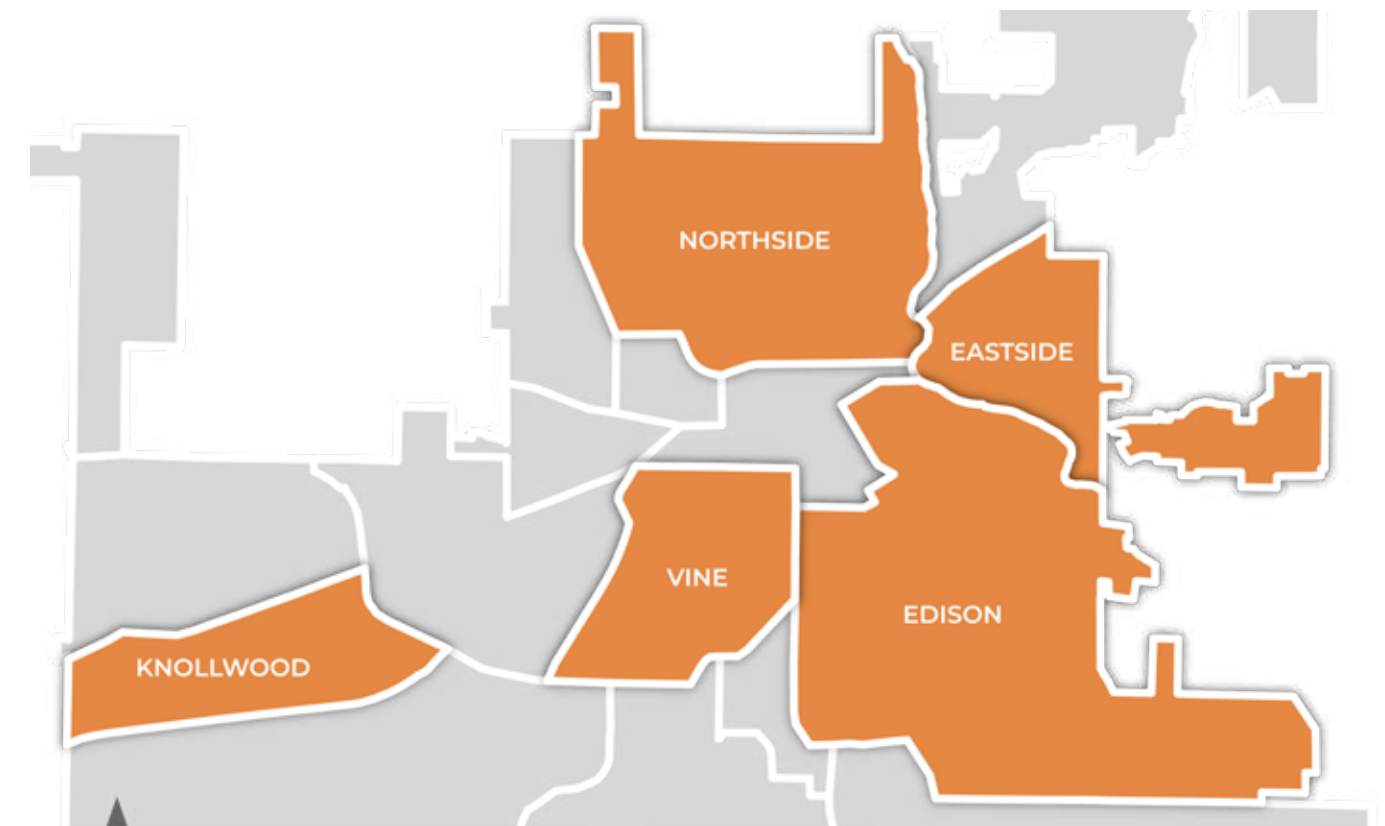
- Total units: 2,801
- Constructed before 1940: 37%
- Valued at less than \$50,000: 79%
- Owner-occupied units cost burdened: 69%
- Renter-occupied units cost burdened: 71%
- Powered by natural gas: 44%
- Powered by electric only: 39%*

NORTHSIDE (Eastern Part, Census Tract 2.02)

- Total units: 409
- Constructed before 1940: 60%
- Valued at less than \$50,000: 50%
- Owner-occupied units cost burdened: 55%
- Renter-occupied units cost burdened: 67%
- Powered by natural gas: 70%
- Powered by electric only: 8%

VINE (Census Tract 6)

- Total units: 2,427
- Constructed before 1940: 63%
- Valued at less than \$50,000: 42%
- Owner-occupied units cost burdened: 86%
- Renter-occupied units cost burdened: 49%
- Powered by natural gas: 60%
- Powered by electric only: <18%



permitting programs. Currently, there are few options for local communities to set higher building codes or standards. Municipalities across Michigan are advocating for a state building code that matches our climate goals. The City will join with peer communities to encourage the state to take action. Encouraging the State to make bold changes to the energy code will require public support, as well. Electric heating suffers from the poor reputation of inefficient older technology. The City will work with partners to promote new electric heating technology.

STRATEGY

Encourage Less Energy Use During Peak Demand Periods

Purpose

Energy demand is the amount of energy needed to power homes, businesses, schools, and industry at any given time. Energy demand is not consistent, it changes throughout the day and with the seasons. Electricity demand is typically higher in the late afternoon and evenings during extreme temperatures. During these times, there is a risk that electricity supply may not be able to meet demand. This can result in higher energy prices and costly blackouts (Environmental Defense Fund, 2019).

To maximize energy efficiency, we need to change the amount of energy we use and when we use it. Shifting when we use energy is called demand response (Office of Electricity, 2021; Nadel, 2017). The CSP promotes demand response as an important energy strategy because it is easy to do and can be done now. Furthermore, it can be done for little

to no cost to customers. A study by the U.S. Energy Information Administration found that in 2015 demand response programs leveraged an average of 10% energy savings for utility grids across the country (Nadel, 2017).

Several incentive programs are available in Kalamazoo now (Consumers Energy Peak Power Saving Program, 2021):

- Smart thermostat program
- AC peak cycling and other appliance programs
- Peak time rebates or rewards
- Critical peak pricing
- Commercial and industrial demand response program

Actions

Continue to implement the City's wastewater treatment plant demand response plan. Commercial and industrial customers can also shift energy-intensive treatment processes to off-peak hours. This is an important strategy to reduce carbon emissions from the energy sector because it reduces the demand for electricity from fossil fuel-burning peaking plants. The City's water reclamation plant currently participates in Consumers Energy demand response program. Under the Energy Reduction Plan, the plant sheds up to 2.0 megawatts of energy load during peak demand periods. The City will continue to partner with the utility provider on demand response.

Encourage energy awareness and waste reduction in City offices and facilities. As the City works to develop and implement an energy management plan for City-owned buildings, workplace practices

and protocols will be developed to reduce energy waste within buildings. A combination of technology and behaviors will be evaluated. Departments will work collaboratively with employees to adopt green practices as a way for staff to support sustainability initiatives.

A 2015 study by the U.S. Energy Information Administration found that demand response programs leveraged on average 10% energy savings for utility grids across the country.

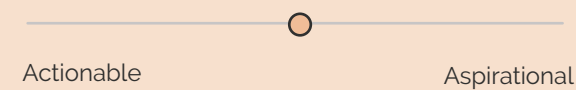
Goal: Decrease emissions from City vehicles, equipment, & infrastructure assets

Electrify city fleet

ACTIONS:

- Pilot EV fleet vehicles and install initial charging stations
- Create and implement a long-term fleet management and EV transition plan for light-duty fleet

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

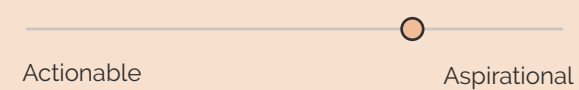
COST: \$ \$ \$ \$ \$

Invest in energy efficient City equipment and infrastructure

ACTIONS:

- Select energy efficient and lower emissions options when upgrading and replacing equipment and infrastructure
- Continue to optimize and automate operation of public utilities
- Upgrade public utility assets and infrastructure to target significant energy loads

FEASIBILITY: Horizon



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Goal: Decrease Emissions from City Vehicles, Equipment, and Infrastructure

As part of the CSP, the City must do its part to reduce carbon emissions from vehicles it operates. We know that transportation was the top emitter of carbon in the U.S. in 2019 (EPA, 2020). Most emissions came from light-duty vehicles (58%) followed by medium- and heavy-duty trucks (24%). The City also owns and operates a variety of infrastructure and utility assets powered by fossil fuels and electricity.

Part of the challenge to cleaning up vehicle and equipment emissions is the need for new technology. Electrification presents some limitations without a local and highly reliable clean energy source. The strategies in this chapter take into consideration

the long-term planning, need for advancement in technology, and cleaner energy grid needed to reach net zero carbon.

The strategies for this goal are layered and adaptive:

- **Use cleaner fuels in the interim.** The City is piloting a biodiesel fuel blend for heavy-duty vehicles and equipment. Overall, biodiesel reduces carbon emissions when compared to petroleum diesel.
- **Transition light-duty fleet first.** Begin electrifying the City's fleet by starting with light-duty passenger vehicles. Performance and operations can be tested on cars used for daily jobs that are not mission critical. Vehicles that are used during the day and parked at night will allow for the necessary charge time.
- **Choose efficient, low emissions technology as equipment and infrastructure is replaced.** To maintain essential services that are reliable and

	FLEET VEHICLE CRITERIA	GOAL
1	Returns to base for overnight parking, charging	Avoid major change in routine
2	Drives fewer miles than full charge battery range	Limit interruptions in staff productivity
3	Less mission critical or readily available backup	Limit interruptions in operations
4	Higher public visibility	Serve as public awareness opportunity

permit-compliant, the City will need to prioritize efficiency upgrades. Energy loads, cost savings, and performance will be used in decision-making.

The CSP strategies for reducing emissions from vehicles and other equipment and infrastructure are described in the previous summary boxes. The actions show how energy efficiency can be gained over time through continual system improvements. Progress toward this goal will be tracked and adapted through the CSP annual evaluation process.

STRATEGY

Electrify City Fleet

Purpose

Recent announcements from U.S. auto makers have signaled that plug-in electric vehicle (EVs) are the future (General Motors, 2021; State of Michigan, 2021; Wayland, 2021). Kalamazoo can lead the way by creating a plan to transition fleet vehicles to EV models, beginning with light-duty vehicles used for short trips. This strategy relies on the City creating a long-range fleet transition plan. It will require layering of grant opportunities, general fund budget planning, and other funding sources or cost efficiencies.

A phased plan beginning with a pilot project will help staff and departments test EV models. A pilot will provide information on future maintenance costs and determine what models best meet needs before scaling up. The Fleet Vehicle Criteria Table includes criteria that must be considered when choosing which fleet vehicles are good candidates for EV

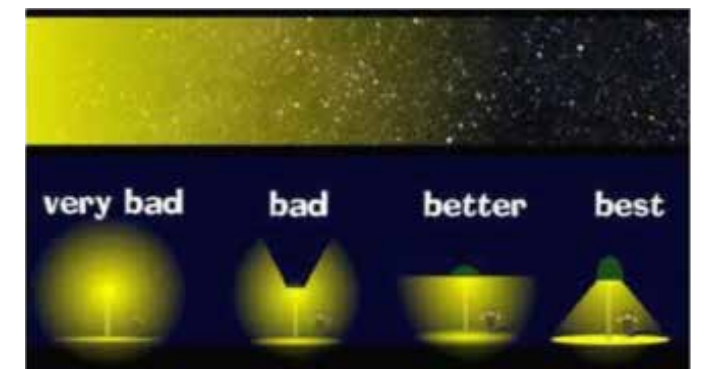
replacement.

Actions

Pilot EV fleet vehicles and install initial charging stations. Many of the City's light-duty fleet vehicles are leased as a cost-savings measure. This model fits well with a vehicle pilot program. The City will develop a strategy to pilot EV for fleet that meet the appropriate criteria. The strategy will include both leasing of EV for light-duty work vehicles and installation of charging infrastructure.

Create and implement a long-term fleet management and EV transition plan for light-duty fleet.

Transitioning to an EV fleet vehicles with require long-term planning and layering of resources. Decision support tools like DRVE can help inventory vehicles, identify needs and efficiencies, explore cost models, and set priorities in a data-informed way (Atlas Public Policy, 2021). For many employees, fleet vehicles serve as their primary or secondary office space. The process to electrification will require consensus building of all levels of leadership and departments around desired outcomes and time scales. The City will work toward a comprehensive



Best practices lighting: futurism (2013).

fleet management strategy that includes an EV vehicle transition plan.

STRATEGY

Invest in Energy Efficient City Equipment and Infrastructure

Purpose

This strategy will work to build energy efficiency considerations into the procurement process for equipment and infrastructure used by City departments and the public. The City operates many heavy-duty vehicles, equipment, and infrastructure for essential services. Many of the City's heavy-duty vehicles are used regularly during day and night shifts. Activities like snow removal, street and water line repair, tree maintenance, and emergency response can be called upon at any time.

Readiness and reliability are important factors when purchasing equipment and infrastructure. The CSP

aims to prioritize changes to purchasing practices that will impact significant energy loads, when possible. Departments regularly consider a variety of factors to ensure that public utilities like drinking water is reliable, safe, and meets permit requirements. Energy efficiency is an important secondary goal that will be factored into decision-making

Actions

Select energy efficient and lower emissions options when upgrading and replacing equipment and infrastructure.

Reducing carbon emissions will require long-term investment in more efficient equipment and infrastructure over time. The street lighting network is one example. As poles are repaired, replaced, or adding with new projects, high efficiency LEDs are used. The City will implement new street lighting design guidelines through its new Street Design Manual. Other equipment and infrastructure efficiency will be addressed through the City's procurement process.

Continue to optimize and automate operation of public utilities.

The City as public utility operator will continue to optimize operation of the drinking water and wastewater systems. These systems use automation and other technology to operate a complex system of pumps, lift stations, and other motorized infrastructure. Supply and demand are managed across the City for reliability and efficiency.

Upgrade public utility assets and infrastructure to target significant energy loads.

Decisions on infrastructure and public utilities must be evaluated on a system-wide basis. Infrastructure and utility assets are maintained and upgraded through the Capital Improvement Program (CIP) and budget. The City will leverage the CIP as an opportunity to gain energy upgrades as infrastructure is replaced.





Healthy Prepared Community

SUPPORTING A HEALTHY AND PREPARED COMMUNITY FALLS AT THE INTERSECTION OF ENVIRONMENT AND PUBLIC HEALTH. TOP ENVIRONMENTAL HEALTH CONCERNS LIKE AIR POLLUTION AND EXPOSURE TO HEAVY METALS ARE NOT FELT EVENLY ACROSS KALAMAZOO. THEY CREATE CUMULATIVE, DISPROPORTIONATE, AND INEQUITABLE HEALTH RISKS TO URBAN RESIDENTS, ESPECIALLY IN CHILDREN AND THE ELDERLY.

This plan envisions a future Kalamazoo where people, businesses, and nature are more resilient to natural and human disasters, changing weather patterns, and unforeseen events. This chapter explores the concept of climate vulnerability and how a healthy environment can help us adapt. The strategies in this chapter are less focused on net-zero carbon actions and more centered on how Kalamazoo can be “nature positive”.

Supporting a healthy and prepared community involves addressing environmental and public health factors. Some of the top environmental health concerns in the U.S. come from air pollution, water quality, heat, and exposure to heavy metals such as lead (Office of Disease Prevention and Health Promotion, 2020). These conditions create cumulative, disproportionate, and inequitable health risks to urban residents, especially in children and the elderly.

To realize a more resilient and healthy future for everyone in Kalamazoo, two goals have been set forth:

- Protect the natural environment for urban resilience
- Create a healthy and resilient community

Introduction

Kalamazoo is already feeling the effects of climate change. We are getting more intense rainstorms and hotter dry spells. A healthy ecosystem can help protect Kalamazoo from the impacts of climate change. Structural changes are needed too. These changes will improve community health and help us adapt to climate change. Removing environmental contaminants and preparing for climate-related hazards will help build a stronger community. The CSP focuses on ways the City can use its position as drinking water utility, public works manager, and housing regulator to take action that will protect people and the places they live.

Understanding Resilience in Kalamazoo

Community resilience is an important factor in preparing for threats and disasters. Resilience is the ability to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions (NIST, 2016).

The socio-economic characteristics of a community tell a lot about sensitivity and risk. Some segments of the population are more likely to struggle with social, health, or economic issues due to things like race, age, poverty, and education level. The impacts of climate change are likely to make this struggle greater over time. Much of this inequity is linked to racial injustices and other social determinates of health .

Place is important in understanding vulnerability. Not all areas of the City will feel the same impacts from climate change. For example, a neighborhood with good tree canopy will experience lower temperatures than less treed areas. Bigger storms will impact areas in the floodplain more than upland areas. Places are more vulnerable to urban heat island effects and stormwater runoff when there are fewer trees and lots of impervious, or hardened surfaces.



The CSP relies on the Neighborhoods at Risk tool developed by Headwaters Economics (2020) to identify at-risk people, places, and infrastructure. The interactive tool maps vulnerability by showing census tracts with more risk factors. Then it layers in areas more prone to climate exposure. Using this information, the actions in the CSP focus on those with the highest need.

Strategic Direction

This chapter focuses on a two-part solution to advance community health and resilience. It does not include every climate adaptation and resilience opportunity, rather it focuses on actions where the City has an active or supporting role. As climate science and adaptation models advance, this section of the CSP will be re-evaluated and adapted to reflect the most critical community needs. The two goals of this chapter recognize:

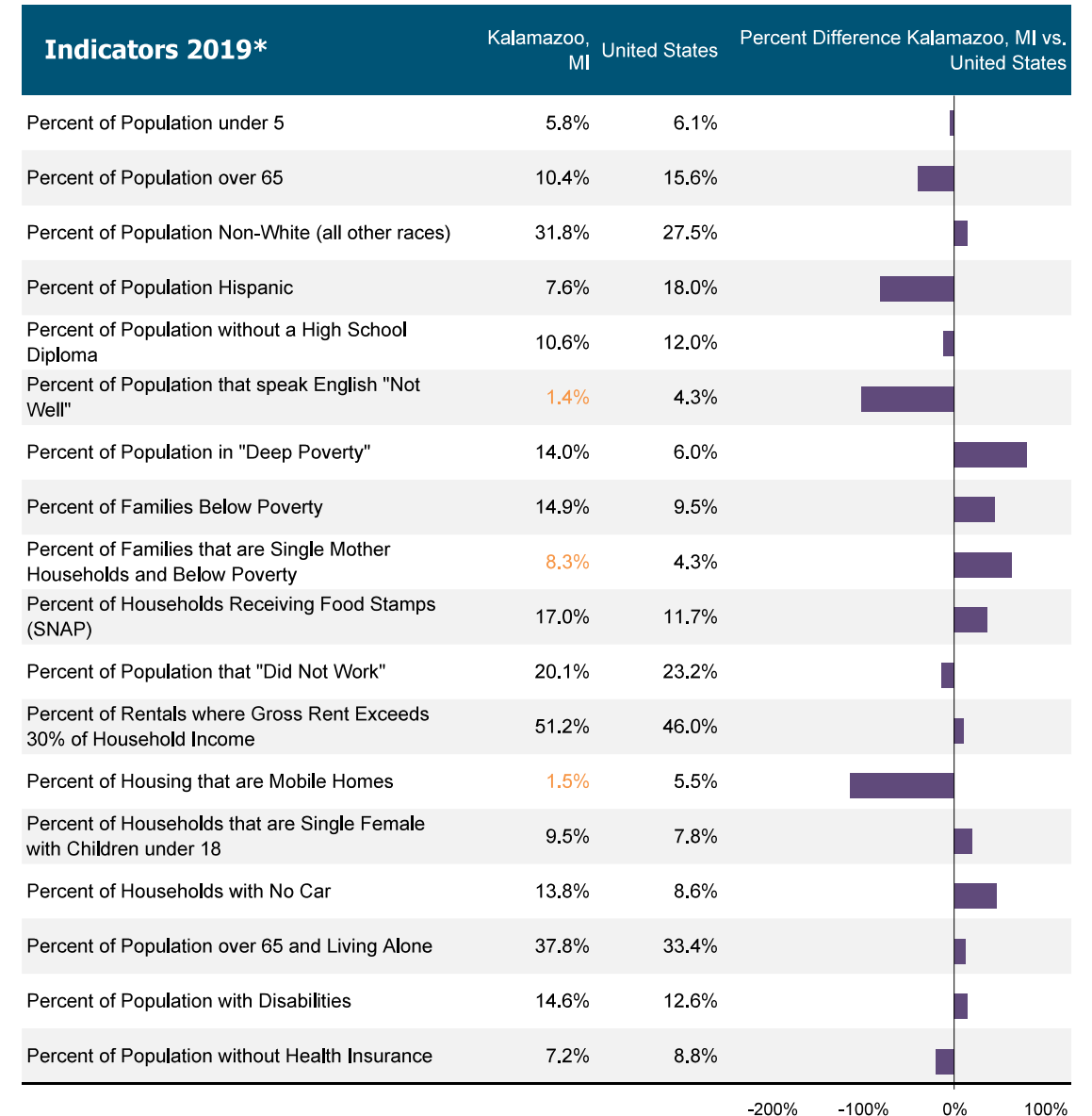
- A healthier natural environment will mitigate climate change and protect people and places.
- Environmental health and flooding must be addressed to reduce community risk and improve health and quality of life.

Many of the actions in this chapter will require long-range planning and implementation. The solutions are resource intensive and will take decades to track before meeting our goals. Intermediate milestones and targets are discussed in the Implementation Chapter.

Populations at Risk

Kalamazoo, MI

Benchmarks



High Reliability: Data with coefficients of variation (CVs) < 12% are in black to show that the sampling error is small.
Medium Reliability: Data with CVs between 12 & 40% are in orange. These values should be interpreted with caution.
Low Reliability: Data with CVs > 40% are displayed in red to indicate that the estimate is considered very unreliable.

* ACS 5-year estimates: 2019 represents average characteristics from 2015-2019; 2010 represents 2006-2010.

CITATION: U.S. Department of Commerce. 2020. Census Bureau, American Community Survey Office, Washington, D.C., reported by Headwaters Economics' Populations at Risk, headwaterseconomics.org/par.

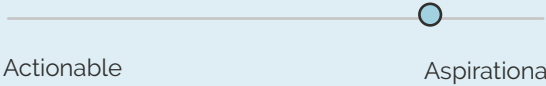
Goal: Protect the natural environment for urban resilience

Equitably Increase the Tree Canopy across the City

ACTIONS:

- Use the street tree inventory to update the City's forestry management plan
- Plant more trees community-wide and monitor canopy coverage
- Update City tree policies and zoning ordinance to promote "right tree, right place" principles
- Promote better forestry on private property through stewardship & education (NFP Phase 3)

FEASIBILITY: Horizon



CITY ROLE:

- Act
- Connect
- Advocate

TIMELINE:

- Short
- Mid
- Long
- Extended

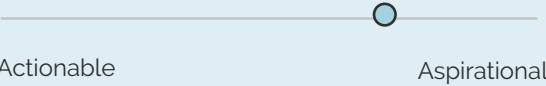
COST: \$ \$ \$ \$ \$

Create Opportunities for People to Interact with Nature and Improve Biodiversity

ACTIONS:

- Manage City-owned natural areas for better ecosystem health
- Update zoning ordinance to support more biodiversity
- Increase job training and market opportunities for native landscaping
- Collaborate on environmental education and stewardship

FEASIBILITY: Horizon



CITY ROLE:

- Act
- Connect
- Advocate

TIMELINE:

- Short
- Mid
- Long
- Extended

COST: \$ \$ \$ \$ \$

Design a built environment more integrated with wildlife

ACTIONS:

- Develop an inclusive process for the public to gain understanding on wildlife and ecosystem concerns
- Monitor wildlife-related data to understand risks and set action levels
- Partner to implement and advocate best practices for urban wildlife protection

FEASIBILITY: Priority to Launch



CITY ROLE:

- Act
- Connect
- Advocate

TIMELINE:

- Short
- Mid
- Long
- Extended

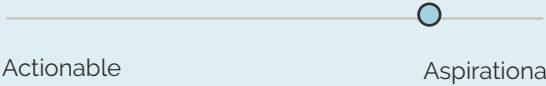
COST: \$ \$ \$ \$ \$

Collaborate regionally for better water quality in rivers, lakes, and streams

ACTIONS:

- Work with partners to implement watershed management plans, education plans, and best practices
- Prioritize local streams to support daylighting and riparian buffers
- Create a blue/green trail plan focused on equal access

FEASIBILITY: Horizon



CITY ROLE:

- Act
- Connect
- Advocate

TIMELINE:

- Short
- Mid
- Long
- Extended

COST: \$ \$ \$ \$ \$

Goal: Protect the Natural Environment for Urban Resilience

Nature-based solutions can help protect Kalamazoo from extreme weather. These solutions involve working with nature to address societal change and challenges. Actions that protect, restore, or manage natural and semi-natural ecosystems make urban areas more resilient. Using nature-based solutions provides benefits to both social well-being and biodiversity. To realize these benefits, nature-based solutions use both no- and low-tech practices and high-tech, engineered solutions to tap into the adaptive and resilient features of nature.

STRATEGY

Equitably Increase the Tree Canopy Across the City

Purpose

Expanding the urban tree canopy and managing good tree health over time is one example of a local nature-based solution (Ziter et al., 2019). Trees absorb carbon to offset climate change and help us adapt (Brown, 2021). Urban tree canopy refers to the layers of tree leaves, branches, and stems that create shade on the ground when viewed from above (U.S. Forest Service, 2021).

To understand the tree canopy in Kalamazoo, staff performed an analysis using high-resolution aerial imagery from 2018 (USDA Farm Service Agency). It


found that approximately 33% of the City is covered in tree canopy. Figure (X) shows an example of the analysis and how tree canopy covers different parts of the City.

In 2021, the City completed an on-the-ground street tree inventory. It included tree counts and community benefits. It estimates Kalamazoo has over 22,000 trees in the City right-of-way and 12,300 potential planting sites. Figure (X) shows 25 percent of trees are 25" or greater in diameter. Overall, Kalamazoo's street trees are a "maturing" public tree population. Nearly 87% of trees are in good or fair condition.

The inventory provides an estimated of community benefits from these trees, as well. The benefits include climate-related benefits and other resource and financial gains:

- 2,700 metric tons CO₂ avoided and 4,000 metric tons CO₂ sequestered
- 4.5 million kWh energy saved and 628,000 Therms saved
- \$40.4 million gallons of water saved
- \$3.5 million in ecosystem services annually

Tree canopy in Kalamazoo is not equally distributed across all neighborhoods. This means neighborhoods



The right amount of tree cover can lower summer daytime temperatures by as much as 10 degrees (F).

do not receive equitable tree canopy benefits. Tree canopy cover ranges from as low as 9% in the Central Business District (Downtown) up to 45% in the Hill 'n Brook neighborhood. Six neighborhoods fall in the

Tree canopy cover by neighborhood from NAIP imagery analysis (2018)

Neighborhood	Canopy Size (acres)	Total Size (acres)	Tree Canopy Cover (%)
CBD	25	286	9
WMU/KRPH	154	641	24
Milwood	762	3,116	24
Northside	284	1,118	25
Stuart	28	109	26
Edison	505	1,776	28
Colony Farm	121	407	30
Knollwood	143	481	30
Arcadia	185	613	30
West Main Hill	59	192	31
Southside	46	138	33
Vine	179	520	34
South Westnedge	497	1,331	37
Douglas	127	325	39
Westwood	188	479	39
Westnedge Hill	286	664	43
Oakland/Winchell	556	1,286	43
Oakwood	129	295	44
Burke Acres	522	1,174	44
Hill N' Brook	97	214	45



Images from the City's tree canopy analysis showing canopy cover near Crosstown Ponds (top) and Bronson Park (bottom).

bottom third for canopy cover. They represent over 43% of the land area in the City, and their coverage is well below the 33% City average.

Actions

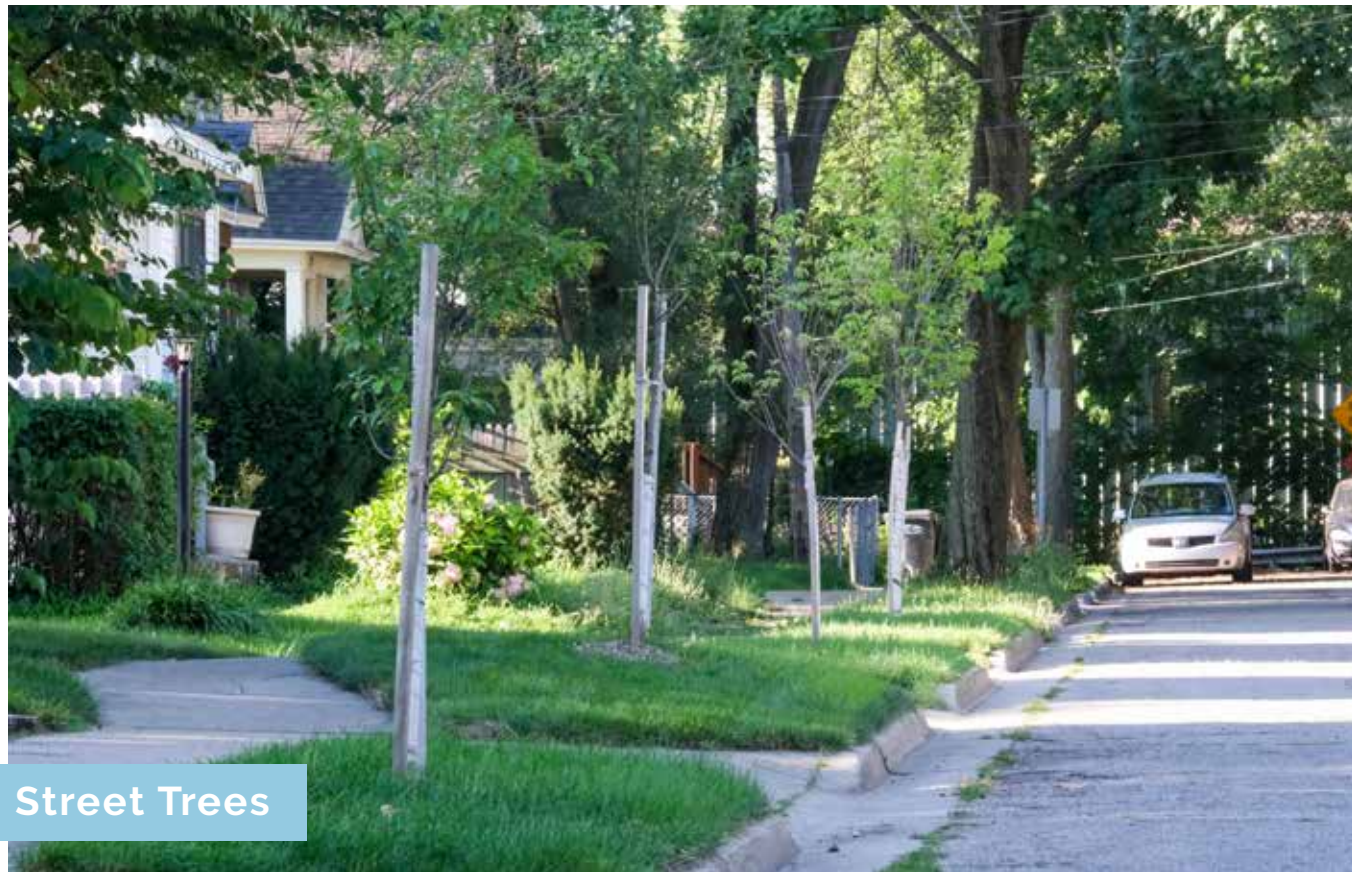
Use the street tree inventory to update the City's forestry management plan. An updated urban forestry management plan will help the City prioritize planting opportunities and maintenance. Implementing this plan will increase tree health and expand the tree canopy in priority areas of the City.

In 2021, the City planted 300 new Michigan-native trees in the City right-of-way. The City will continue to target this level of annual tree planting with the support of the Foundation for Excellent and other foundations.

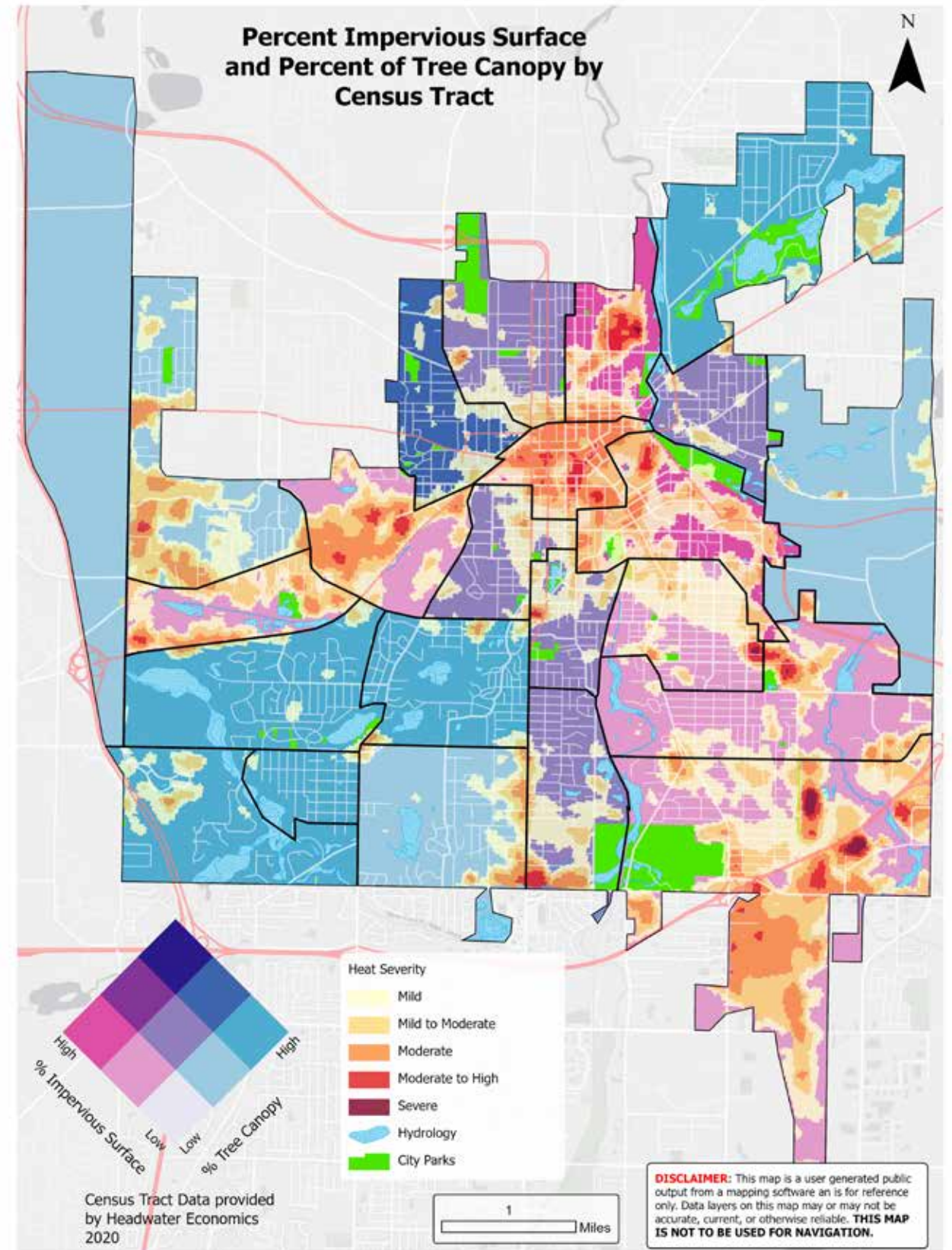
Plant more trees community-wide and monitor the tree canopy. In the past, most urban forestry experts recommended a blanket canopy goal of 40% coverage for areas with our climate. Today there is a new best practice in urban forestry. Experts recommend setting evidence-based tree canopy goals. This approach recognizes differences in neighborhood characteristics and goals. For example, the CBD will not support the same large tree canopy like the Oakland Drive-Winchell neighborhood because downtown is designed for building density. Reaching our target of equitable tree canopy across all neighborhoods will require regular measurement of the canopy every 5-8 years as new imagery is

available. The City will track progress toward canopy goals on public land and facilitate measures on private land to the extent possible. Annual City tree planting must be coordinated with priority neighborhood areas according to their own goals informed by the residents living there.

Update City policies to promote “Right Tree, Right Place” practices. This principle uses sound planning practices to evaluate things like a tree’s mature height, form, shape, and growth rate to select the proper tree for a particular setting. This helps avoid removing trees in the future when they no longer fit their setting. The City’s Zoning, Natural Features Protection (NFP), and the Tree Ordinance



Street Trees



Map of Heat Island Effect by Heat Severity and Impervious Surface and Tree Canopy Coverage. Map created by Author(s). Sources: Headwater Economics, Descarted Lab, ESRI

are all policies that control tree planting on private development and the public right-of-way. The City will work to evaluate these policies to find opportunity for alignment. The goal is for all ordinances to guide planting that promotes "right tree, right place" practices to improve long-term health and survival of trees.

Promote better forestry on private property through stewardship and education (NFP Phase

3). Educational outreach and surveying of residents, alongside partnerships with neighborhood associations and conservation groups will create lasting stewardship of the urban forest of the city. Phase three of the City's NFP project aligns with the work involved in this action.

Tree stewardship on private land will require a champion organization to coordinate with groups and neighborhoods. The City will serve as connector to provide resources and support. A key aspect of this action is to help private landowners and residents find and plant climate-resilient trees and encourage long-term care.

STRATEGY

Create Opportunities for People to Interact with Nature and Improve Biodiversity

Purpose

Since NFP was first adopted, the City envisioned a third phase focused on stewardship and education. The purpose is to protect natural features and increase biodiversity on land not directly under



According to the Trust for Public Land (2021), around 60 percent of Kalamazoo residents live within a 10-minute walk of a park.

the control of the City. This strategy in the CSP supports the idea that when people have access to nature, or "green space" it increases awareness and stewardship.

According to The Trust for Public Land (2021) the majority of Kalamazoo's residents are within a ten-minute walk of a park (60%). This access is around five percent higher than the national average. It does not include some of Kalamazoo's larger green spaces like Kleinstuck, Asylum Lake, or Bow in the Clouds preserves.

The City's Master Plan includes an analysis of approximate walking distances from parks and preserves extending out into neighborhoods one-quarter mile. The largest gaps in walkable parks were identified in Arcadia, Knollwood, South Westnedge, Westnedge Hill, Millwood, and Edison neighborhoods with smaller gaps in the Douglas and Eastside.

Since the Master Plan and Parks Plan already set goals and track progress toward access to green space, actions that increase access to parks have

been left off the CSP action table. Instead, the CSP focuses on actions to increase biodiversity and how to protect and improve the health of natural areas.

Actions

Manage City-owned natural areas for better ecosystem health (U.S. Forest Service, 2016).

Beyond the health benefits and stress reduction green spaces offer community members, these spaces act as critical habitat within the City (Brusseau et al., 2019). Biodiversity can be increased by incorporating more plant types and species in areas covered in mowed lawn.

The City has worked with volunteers to help improve natural area health on a smaller scale. Successful large-scale models of natural area preservation all require dedicated revenue sources. In lieu of a millage or steady revenue source, the City will work with partners to obtain grant or similar funding. The community can leverage knowledge of experienced conservation groups and continue to build volunteer capacity.

Neighborhood input will be critical before setting priority areas. Once funding is identified, the next steps will involve habitat assessments and long-range



restoration plans. Early steps will set up the City for long-term results and success.

Update the zoning ordinance to support more biodiversity.

Several sections of the Zoning Ordinance set standards for landscaping, nuisance weeds, and other natural features. Using the NFP standards as a guide, the City will amend the Zoning Ordinance to guide landscape plantings and management. Similar to NFP, City policies should prohibit the most aggressive invasive species and encourage native and diversity of species for resilience.

A special species of interest are pollinators. These species need more naturalized areas with native plants to thrive. An important action for implementation is to identify where residents would like to see more naturalized no-mow areas and provide stewardship opportunities to facilitate more pollinator species and manage for ecosystem health.

Increase job training and market opportunities for native landscaping.

Two barriers to more natural landscaping is: (1) limited native plant supply at scale, and (2) lack of experience in maintenance. The City will support local programs that provide important opportunities to expand native landscaping. Working with community partners, a local training program is needed to building maintenance capacity within the private sector.

The City will also act as connector to build opportunities for more native plant growers. These types of plants are more beneficial to pollinators and other wildlife and are not commonly used in

EQUITY GUIDE

In cities across the U.S. tree canopy is not equally distributed (Cusick, 2021). This inequitable distribution of trees exacerbates social inequities. In 2021, an analysis by American Forests found communities of color have 33% less tree canopy on average than majority white communities. Neighborhoods with 90% or more of residents living in poverty have 41% less tree canopy than communities with only 10% or less living in poverty.

American Forests created equity tool called the Tree Equity Score (TES). The TES is a metric created to assess how equitably distributed tree canopy cover is to all residents and involves tree canopy cover, climate, demographic, health, and socioeconomic data. A score of zero represents not delivering great access to tree canopy and 100 being great access to tree canopy. These metrics represent factors that result in higher vulnerability to climate change impacts.

Overall, the City of Kalamazoo has a score of 90 out of 100. A closer look at individual neighborhoods reveals much lower scores in core areas of the City. Of the 76 Census block groups analyzed within the borders of Kalamazoo, six had tree equity scores below the 75-point threshold. These cover parts of downtown, Edison, Northside, Milwood, and Knollwood neighborhoods.

The tool estimates an increase of tree canopy by 1.5%, or approximately 20,900 trees, is needed to bring all areas up to a TES of 75. This increase has the co-benefit of supporting over 150 jobs.

Areas of the City with the lowest Tree Equity Scores are priority areas for tree planting. An inclusive neighborhood engagement process will help residents lead the efforts. Not all neighborhoods will have the same goals when it comes to tree canopy. Robust neighborhood involvement will ensure the right tree in the right place for long term success.

development projects. Actions to inform and grow the market for native landscaping plants is an important implementation action to realize better natural habitat.

Collaborate on environmental education and stewardship. This action aligns with NFP phase three to increase biodiversity through private property stewardship. The City will work with partners like the NFP Review Board, conservation organizations, and stakeholders to develop public education opportunities. Programs that combine access to nature, natural landscaping, and habitat restoration will advance this strategy. Place-based programs that demonstrate hands-on skills will help build interest and participation. Successful examples can be found at all of the nature preserves in Kalamazoo and in neighborhood parks and curb lawns.

STRATEGY

Design the Built Environment to be More Integrated with Wildlife

Purpose

Kalamazoo is an urban city built to different intensities and densities. It also fosters natural areas that support local ecology and wildlife. There are three designated nature preserves and two large parks in the City that collectively provide over 625 acres of natural land. The built environment can also cause conflicts between people and wildlife. Kalamazoo has large areas of impervious surface that fragment natural wildlife corridors.

Using different design choices in the built environment is one example of best practice to bring

about safer human-wildlife interactions. For example, bird-safe building design is used across the U.S. to protect local songbird and migratory birds from preventable injury or death. And more complete streets with right-sized lanes, traffic calming infrastructure, and slower speeds may decrease deer and other animal related collisions. Monitoring wildlife and setting action levels will be needed to understand what problems existing in the community and prioritize actions.

Actions

Develop an inclusive process for the public to gain understanding on wildlife and ecosystem concerns.

Kalamazoo is surrounded by rural areas at its borders, and much like those areas, sustains a deer and wildlife population that is admired by some and seen as an issue by others. A group of neighborhood associations, under advisement with city staff and other agencies, surveyed residents to understand the deer population. From that survey, the group created a report with a variety of management activities and recommendations.

Kalamazoo needs a formal process that gives citizens the opportunity to explore wildlife and environmental health issues. The process must consider best available science, best practice, public interest, and health and safety risks. Building consensus around risk-based targets and thresholds will help guide the process toward feasible and equitable solutions.

Monitor wildlife-related data to understand risks and set action levels. The City is not a wildlife management agency but has an interest in protecting

public safety and property. The City will serve as advocate for good wildlife management by working with partners to monitor ongoing concerns. Understanding the baseline for things like deer-car accidents and songbird mortality will help partners establish action levels. As data shows an increase in risk of human-wildlife incidents, actions can be made to reduce unwanted incidents. An important part of this action will be involving experts and state and federal agencies who specialize in this area of management.

Partner to implement and advocate best practices for urban wildlife protection. Human-wildlife interactions often end in wildlife mortality and threat to human health and safety. Working with local experts and partners, the City will support efforts to create policies and programs that protect people and wildlife. Through policy and education, the City can encourage bird- and wildlife-safe building design and

development principles.

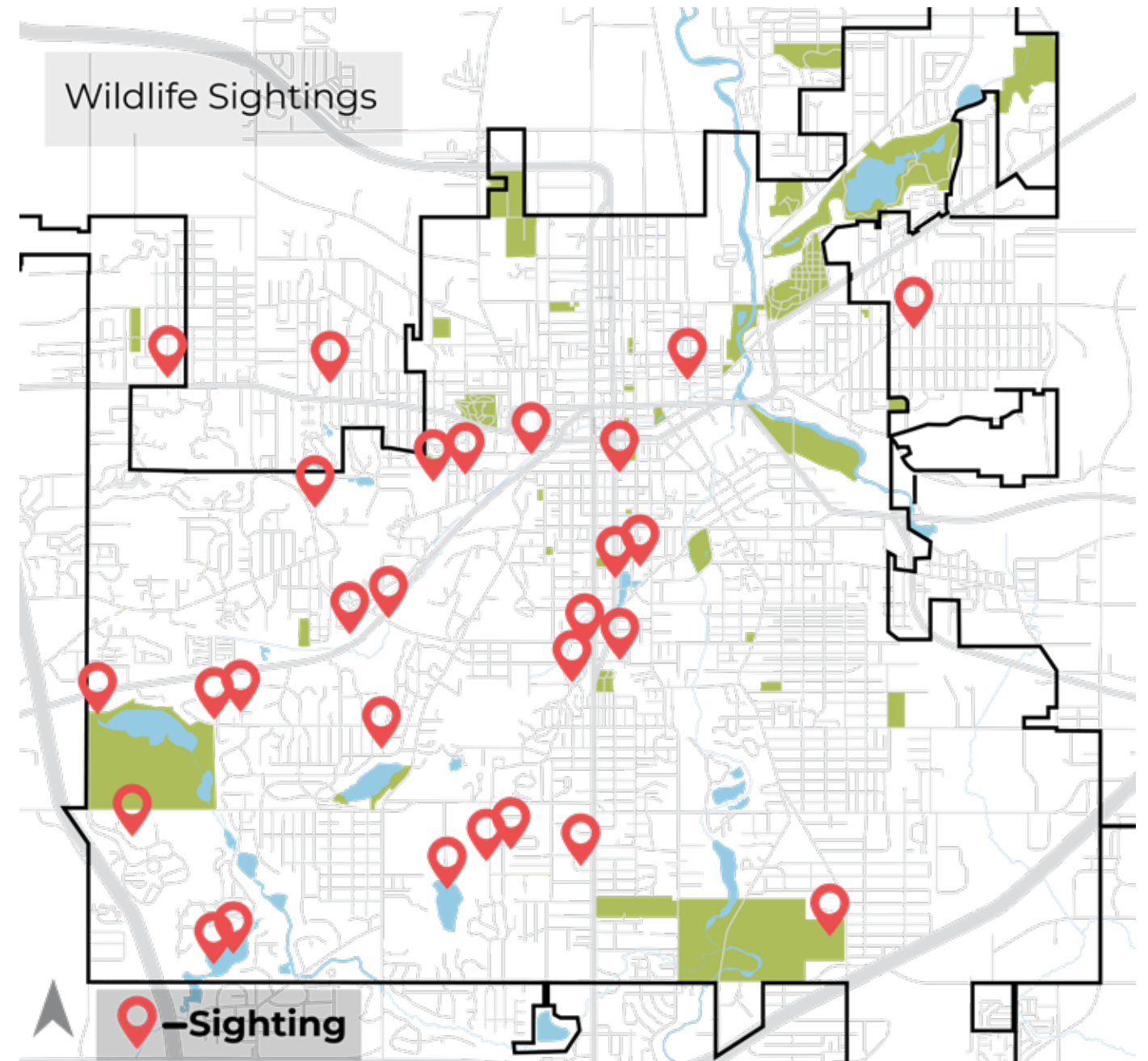
For example, the Street Design Manual includes guidance on Dark Sky Principles. This can help lower the ambient light at night so it does not interrupt birds during migration. Other policies and education opportunities include: prohibiting wildlife feeding, encouraging wildlife resistant plantings, and using zoning tools to enhance wildlife corridors.

STRATEGY

Collaborate Regionally for Better Water Quality in Rivers, Lakes, and Streams

Purpose

Our local system of rivers, lakes, and streams have tremendous economic, environmental, and cultural importance to our community's livability. These waterbodies connect to the groundwater system, which serves as a regional drinking water supply. The



Map of Wildlife sightings in Kalamazoo, MI. Data created from input gathered during the 2019 Sustainability Kick-off event at the Farmer's Market. Map created by Author(s).

Kalamazoo River, along with the fish and wild rice it supports, are culturally important to indigenous peoples in the region.

Much of Kalamazoo is part of the Portage-Arcadia Creek watershed. These tributaries and a portion of the Kalamazoo River flow through the City. They are managed under existing watershed management plans that are implemented in through partnerships with state and local governments, non-profits, and conservation groups. The CSP is not meant to duplicate efforts of the watershed management plan. The strategy outlined in the CSP re-focus water quality issues on Kalamazoo's unique urban concerns, like stormwater management.

Actions

Work with partners to implement watershed management plans, education plans, and best practices. The City is invested in education and leadership toward better stormwater management. Much of these activities are integrated into the City's stormwater permit and wellhead protection program. Collaboration with other local jurisdictions on policy and education has been a key factor for success. Recently, the City worked with Kalamazoo Valley Community College to nest its stormwater permit with KVCC. Along with its partners, the City actively maintains the stormwater public education plan and has been successful in obtaining wellhead protection grants.

The City will work to review and amend local policies and ordinances to protect water resources. The NFP stormwater and protection standards have been

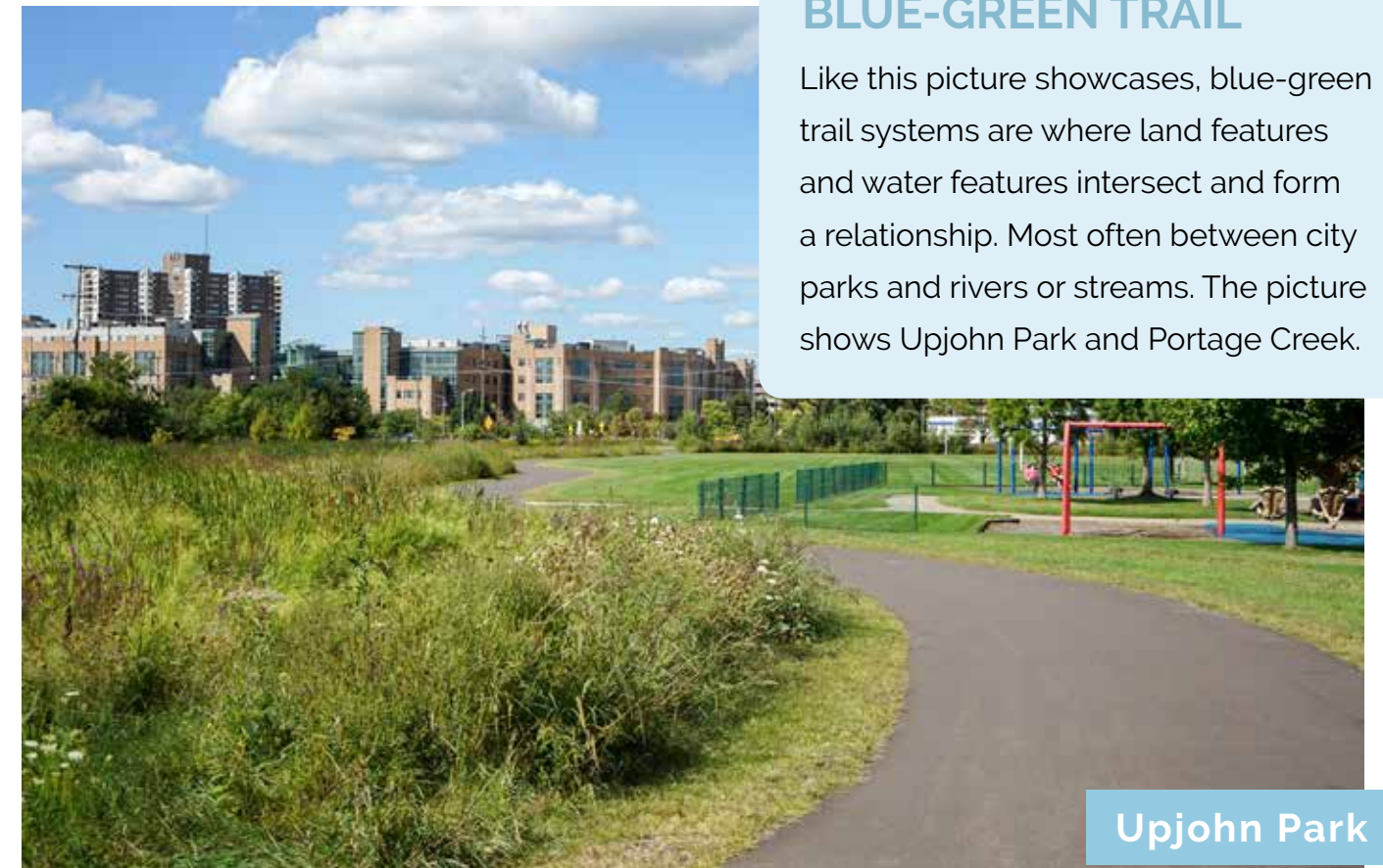
SUSTAINABLE STREET

The City's Street Design Manual creates design element guidance for new development projects in the City.

It calls for pedestrian and roadway lighting that is efficient in both energy use and direction of light.

DESIGN ELEMENTS:

- **Energy Efficiency** - Fixtures should use LED lighting or best available energy efficient technology, solar-powered lighting is encourage for sustainability
- **Dark Skies Compliance** - Fixtures should meet Dark Skies requirements intended to prevent light pollution
- **Up Lighting** - Fixtures must limit or prevent up lighting using visors, shades, cutoffs, or are directional



BLUE-GREEN TRAIL

Like this picture showcases, blue-green trail systems are where land features and water features intersect and form a relationship. Most often between city parks and rivers or streams. The picture shows Upjohn Park and Portage Creek.

successful. The City will explore how these standards could be applied city-wide to increase stormwater treatment and water resource protection.

Prioritize local streams to support daylighting and riparian buffers. In the 1990s the City work closely with partners to daylight a large portion of Arcadia Creek through downtown. To continue this work, the City will evaluate other sections of creeks that are routed underground. Priorities will be set for daylighting when road construction or other large infrastructure projects are completed. Outside funding sources will need to be identified and secured to accomplish this work.

Create a blue/green trail plan focused on equal access. A blue-green trail plan would work to formalize the connections between greenspace and waterways in sections of the City. Neighboring municipalities and stakeholders have started work toward this trailway along the Kalamazoo River. The City will support these efforts by connecting City stakeholders to neighboring efforts and collaborate on funding opportunities. Efforts must center equitable access with economic activities, especially in areas where community members have a historic connection to the river or where access has changed over time.

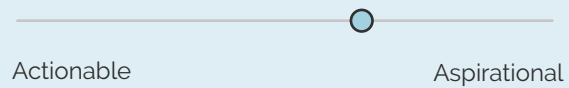
Goal: Support a healthy and resilient community

Inform hazard mitigation and preparedness efforts with climate impacts

ACTIONS:

- Align emergency operations plans with climate models
- Maintain active participation in the Kalamazoo County Response Consortium
- Promote emergency preparedness plans and support systems for businesses, community organizations, and neighborhoods

FEASIBILITY: Horizon



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

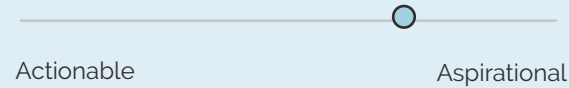
COST: \$ \$ \$ \$ \$

Mitigate flooding to protect people and property

ACTIONS:

- Develop real-time GIS model for flood events
- Evaluate flood diversion alternatives and design flood mitigation projects
- Secure funding to implement flood plain and diversion projects

FEASIBILITY: Horizon



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Invest in programs that protect community health

ACTIONS:

- Complete drinking water supply line replacements to reduce lead exposure
- Promote the City's Water Quality Report to provide transparency
- Continue lead abatement programs and incentives for safer buildings

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Goal: Support a Healthy and Resilient Community

In the Kalamazoo region, weather-related threats and risks will intensify or become more erratic with climate change. Extreme heat events are predicted to increase in frequency and intensity (A Trust for Public Land, 2020). Similarly, changes in the amount and timing of rainstorms will likely increase flooding.

Community resilience is an important factor in preparing for threats and disasters. Resilience is the ability to prepare for anticipated hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions. Preparedness activities like prevention, protection, mitigation, response, and recovery can all be better informed with information from regional climate models.

Not all residents have the same access to the resources and tools needed to prepare for, respond, and recover from natural disasters. The CSP explores the concept of vulnerability using the Neighborhoods At-Risk online tool. The tool helps identify priority areas at the census tract level for adaptation and resiliency support.

STRATEGY

Inform hazard mitigation and preparedness efforts with climate impacts

Purpose

Climate change is known as a risk multiplier. It will likely exacerbate natural disasters and shape emergency response. Preparing for unforeseen but predicted events can protect local systems from being overwhelmed. The COVID-19 pandemic has been a litmus test for preparedness in the field of healthcare and many other systems. Likewise, planning, preparing, and aligning strategies with other organizations will ensure a unified response to local stressors.

In Kalamazoo, emergency response and hazard mitigation are coordinated at the county level. The City acts in a supporting way to assemble, mobilize, and coordinate with an intergovernmental team of responders to any emergency, including natural disasters like flooding.

Actions

Align emergency operations plans with climate models

In 2020, the City Commission adopted an updated Emergency Operations Plan that identified the highest risks of threats and hazards in our area. Several of these can be nature- or weather-driven such as tornadoes, straight-line winds, flooding, extreme cold and warm weather events, widespread power outages, and fires.

The City will work with regional partners to disseminate future climate predictions to emergency response agencies. This will help agencies understand the likeliness and frequency of climate-related events. The City and other municipalities can be more prepared for events like extreme heat, which is predicted to increase over time.

Neighborhoods in the floodplain	Census Tract 1 (Eastside)	Census Tract 2.02 (Northside)	Census Tract 9 (Edison)
Population Size	2,717	846	1,046
% People of Color and Hispanic	76	97	60
% of Households in Poverty	28	24	16
% without a car	27	14	7
% Area within 500-yr floodplain	18	11	27

American Community Survey, 2019

Maintain active participation in the Kalamazoo County Response Consortium

Gryphon Place facilitates the Kalamazoo County Response Consortium. It is a collaboration of nonprofits, government agencies, and local businesses that work to ensure efficient and effective response to the greater Kalamazoo community in times of emergency, crisis, or disaster. The KCRC began following the local flooding of February 2018 and meets regularly to discuss lessons learned. They work to improve individual and collective capabilities and capacities. The City will maintain a presence on the consortium to benefit local emergency preparedness.

Promote emergency preparedness plans for businesses and community organizations

The Kalamazoo County Response Consortium has a special focus on helping businesses, social service

organizations, and institutions to create emergency action plans and continuity of operations plans. The City will continue to support these efforts and promote development of these plans to build resilience for recovery after hazard events.

As an extension to emergency action plans for business and organizations, neighborhoods also need support systems. The City has been working with neighborhood residents to build block groups. The City will leverage this organization within neighborhood to develop climate-resilient support systems. For example, the City can connect local groups like Gryphon Place with organized blocks to introduce community support assistance and training. This will build community resilience to prepare for, respond, and recover after natural and other hazard events.

STRATEGY

Mitigate flooding to protect people and property

Purpose

Kalamazoo is in the river's floodplain, and floods have been occurring even prior to development of the City. Now the hardened surfaces of urban development cause flashy runoff. This has created a two-part problem that exacerbates flooding in Kalamazoo. During floods, low-lying areas around Portage Creek fill with backwater pushing up from the Kalamazoo River. At the same time, creeks and the river get high downstream flows from upstream communities. Rivers and creeks fill quickly, pushing floodwaters over their banks.

Kalamazoo has flood zones along the Kalamazoo River near and south of downtown and the Edison neighborhood. Several recent floods have demonstrated the health and safety risk in the floodplain. In 2008, flooding caused over \$11 million

in damage to infrastructure and buildings, and in 2018 another \$2.5 million in damage was caused by spring flooding (Barrett, 2018).

Actions

Develop real-time GIS model for flood events. The City is working with partners like the U.S. Geological Survey to better understand the real-time flooding impacts to Kalamazoo. Better data can be used to design flood mitigation solutions. The current understanding is that it will take 16,000 acres of land to manage flood water with surface storage capacity. Since this area represents almost 25% of the land area in Kalamazoo, other engineered flood mitigation solutions are needed.

Real-time information during floods is a critical step in adaptation and building community resilience. More information will help people prepare for and protect against flooding, as well as notify people about serious safety risks.

Evaluate flood diversion alternatives and design

Flooding near Downtown

projects. The City will complete work to evaluate a variety of flood diversion alternatives. These engineering solutions will work to alleviate flooding in flood-prone areas. The magnitude of flooding in Kalamazoo will likely require multiple, priority-based projects. The results will be long ranging. Once design alternatives are selected, the next step will be the design phase, which will help scope the projects and develop a budget.

Secure funding and implement flood mitigation and diversion projects. No one solution or project can fix the flooding problems in Kalamazoo. The City will evaluate, secure funding, and implement projects when opportunities arise. Both large and small mitigation projects may be appropriate in different areas. For example, the City is working with the Brownfield Redevelopment Authority and federal and state partners to restore wetlands in the floodplain of Portage Creek. This will result in small, incremental change bringing us closer to the 16,000 acre-feet goal.

STRATEGY

Invest in Programs that Protect Community Health

Purpose

Environmental pollutants can cause health problems like respiratory diseases, heart disease, and some types of cancer. Low-income households are more likely to live in polluted areas and have unsafe drinking water. Children and pregnant women are at higher risk of health problems related to pollution (U.S. Department of Health and Human Services,

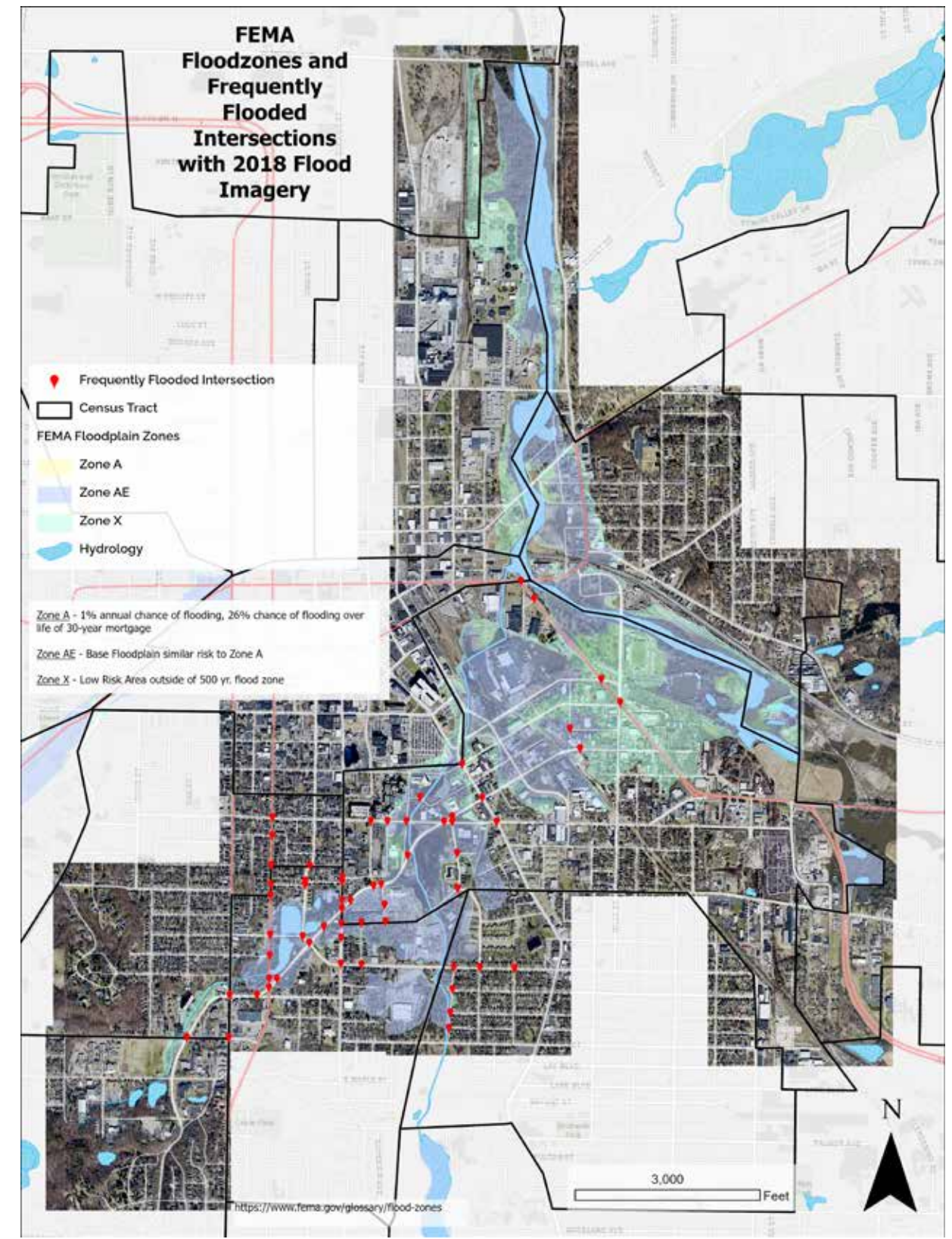
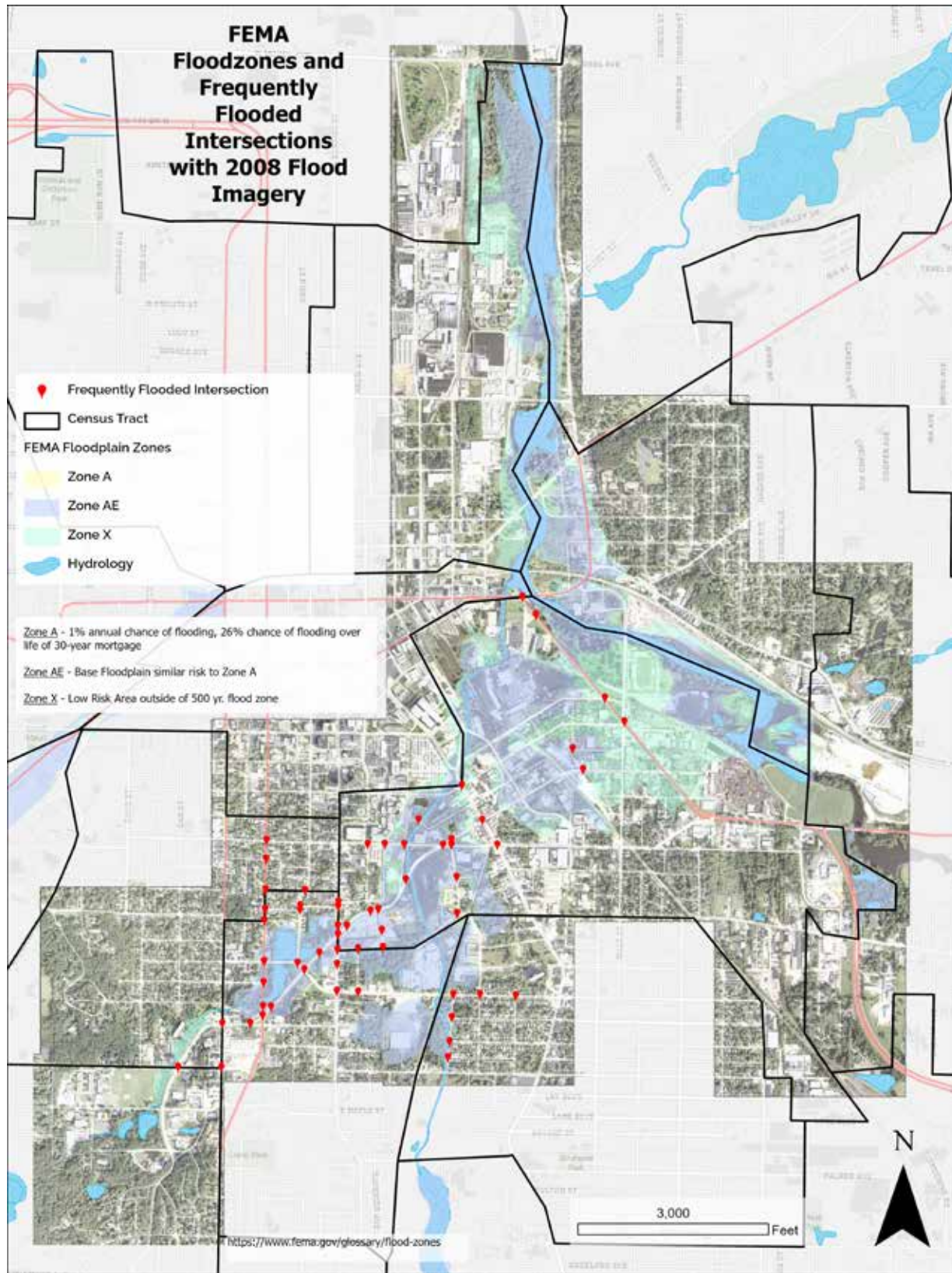
2020). According to the Kalamazoo Community Health Needs Assessment, heart disease (22%) and cancer (21%) are the leading cause of death in Kalamazoo County (Bronson Methodist Hospital, 2016).

Since environmental health concerns stretch across the community, solving these problems requires far reaching community partnerships. Collaboration is needed from the private and nonprofit health care sector, state and county health agencies, and community-based organizations. Several City programs intersect with public health, including our role as public drinking water utility and housing partner and regulator.

EQUITY GUIDE

The neighborhoods with the largest footprint in the 500-year floodplain have a higher percentage of residents living below the poverty level when compared to the City-wide median.

Investment in flood mitigation measures is an investment in equity. Property damage costs from flooding are disproportionately borne by those with the fewest resources to manage during and after floods.



The CSP focuses on areas where the City has a role in protecting and improving community health, such as:

- **Ensuring safe and reliable drinking water.**
The City owns and operates drinking water infrastructure in the City of Kalamazoo and must ensure lead and other harmful contaminants are removed from the system.
- **Partnering to create safer homes.** City government acts as building code and housing inspector for Kalamazoo. The City can be a conduit for funding and programing to help residents and landlords create healthy and safe spaces for everyone to live.

Actions

Replace drinking water supply lines to reduce lead exposure. The City of Kalamazoo has successfully replaced all lead-based drinking water supply lines in the City of Parchment. The City stepped in to assist residents in Parchment after high lead levels were found in the drinking water supply.

The City will continue with supply line replacement in Kalamazoo with a goal of replacing 500 lines each year. Replacements are happening in and around the Eastside neighborhood through mid-2022. The Northside and Douglas neighborhoods are slated for more replacements through late-2023.

Promote the City’s Water Quality Report to provide transparency. Each year the City publishes water quality data on the drinking water supply. The annual report provides insights and transparency into the safety of our drinking water. Continuing to publish and

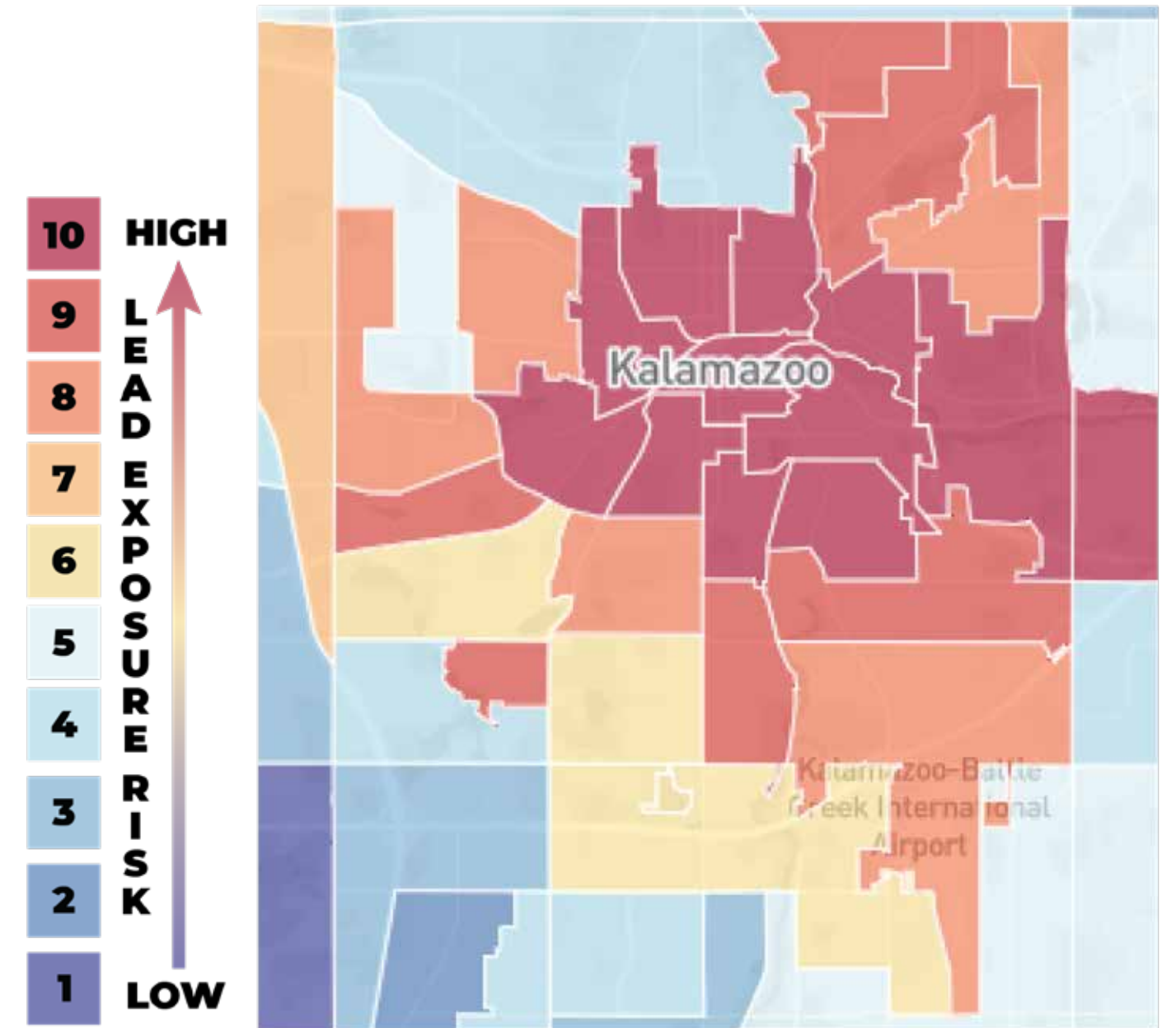
promote this report is important to help customers understand risks and take steps to protect our water supply.

Continue lead abatement programs and incentives for safer buildings. Lead is not isolated only to drinking water. Lead-based paint was commonly used in homes built through the 1970s. Kalamazoo has an older housing stock, majority built prior to 1978, which creates a higher lead risk.

Kalamazoo is partnering with Kalamazoo Neighborhood Housing Services to provide no-cost lead abatement services for homeowners and renters at or below the 80% area median income. A \$2 million HUD grant aims to provide services to 72 homes in Kalamazoo. The average renovation cost has been \$20,000 and the median around \$30,000 for lead abatement.

The program is an example of the investment needed for healthier living spaces focused specifically on those with lower income and children under the age of six. The City will continue to market the program to more households in Kalamazoo. The City will collaborate with community-based partners to seek additional funding sources to continue this work. When possible, pairing home energy retrofits with lead abatement can help accomplish multiple goals and co-benefits.

RISK OF LEAD POISONING BY CENSUS TRACT



Map of Lead Poisoning Risk in Kalamazoo, MI by Census Tract. Source: Vox and ACS 2016. Map Key adapted from original map (Frosteson and Kliff, 2016)

Lurking Lead

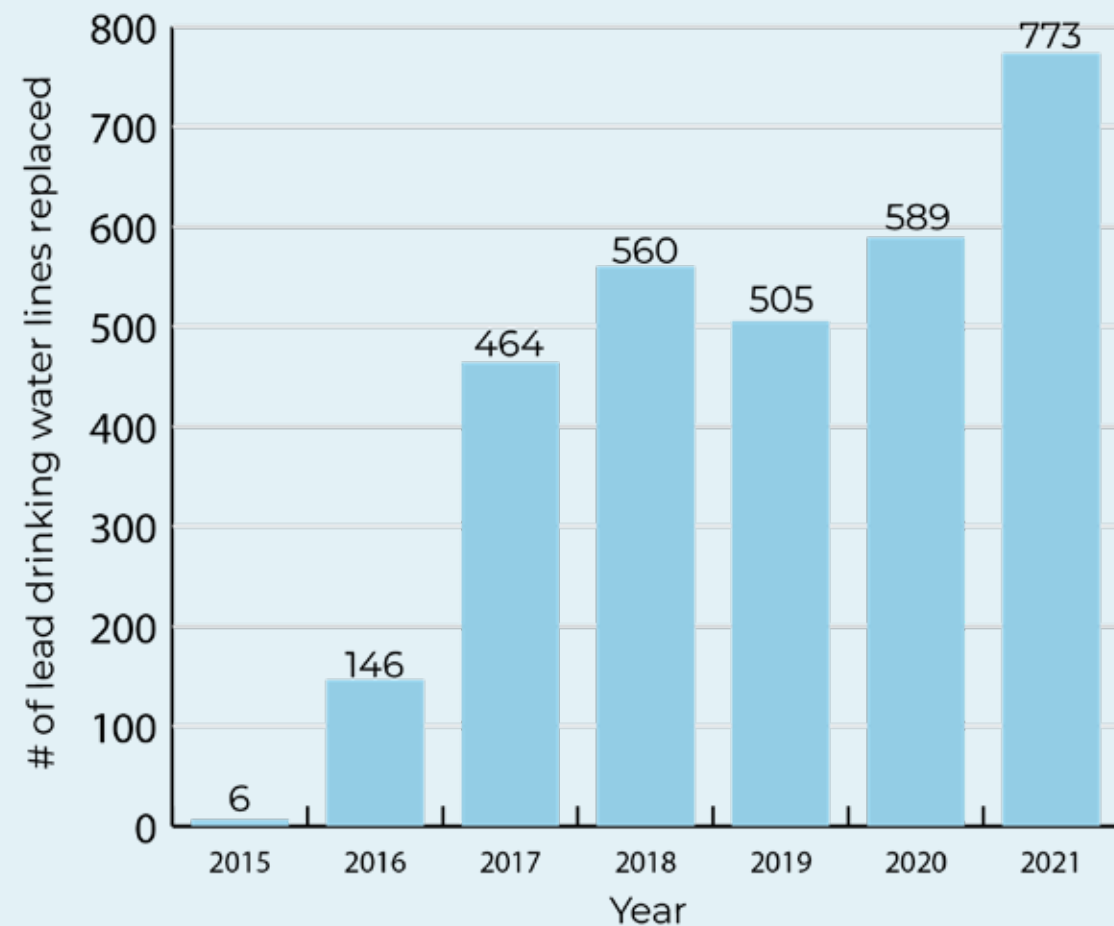
DRINKING WATER PIPES

Drinking water is regulated under federal law for several chemicals. At elevated levels, lead and copper can cause serious health problems.

One of the main sources of lead in drinking water comes from the pipes that deliver water to and through a building to the tap.

The City has replaced over 3,000 supply lines to homes since 2016. The funding that helped this happen came from the Foundation for Excellence. The goal set in IK 2025 is to continue replacing 500 lines each year.

Lead Drinking Pipes Replaced per Year by Public Services



The City of Kalamazoo Drinking Water Utility has accelerated drinking water service line replacement over the past five years. Lead-based service lines will continue to be replaced over the next decade to keep customers safer.

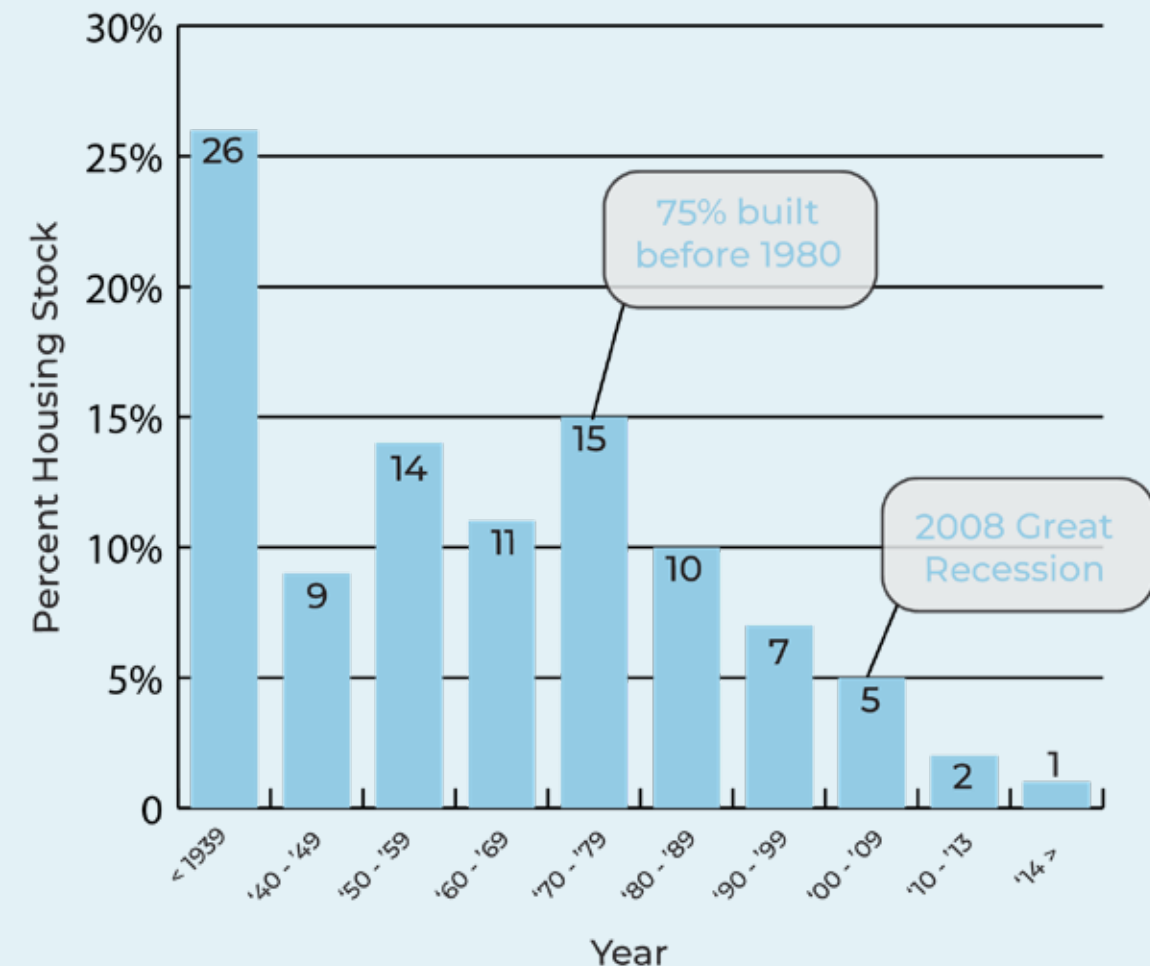
LEAD BASED PAINT

Lead based paint was commonly used in homes built through the 1970s. Kalamazoo has an older housing stock, almost three-quarters built prior to 1978, with a median housing unit age of 1950 (ACS, 2019).

Living in these older homes can pose a serious health risk due to potential exposure to harmful lead paint and other contaminants like asbestos.

A study testing children between 2018 and 2020 found that 3 out of 4 children in Michigan had detectable levels of lead in their blood. Michigan ranks in the top highest three states in the country for child blood lead levels (Fernandez, 2021; Huaptman et al., 2021; Nandi, 2021).

Housing Stock by Year Built



Over a quarter of Kalamazoo's housing stock was built before 1939. Three-quarters of homes were built prior to 1980 when most of the lead-based products, such as paint was taken off the market due to health and safety concerns.



Green Circular Economy

A GREEN CIRCULAR ECONOMY IS ONE THAT SAVES RESOURCES, BUILDS THE LOCAL ECONOMY, AND REDUCES AND RECOVERS WASTE. FOOD SYSTEMS ARE A KEY FOCUS IN A GREEN CIRCULAR ECONOMY. A GREEN CIRCULAR ECONOMY CAN ADDRESS SOCIAL INEQUITIES ASSOCIATED WITH TRADITIONAL LINEAR FOOD SYSTEMS. BY SUPPORTING DIFFERENT SCALE OF FOOD DISTRIBUTION AND WASTE RECOVERY, KALAMAZOO CAN INCREASE ACCESS AND OPPORTUNITY FOR EVERYONE.

Waste management is another key component of a green circular economy. Non-food waste can be captured and used for other inputs like food. At the industrial and manufacturing scale, waste can be transformed into resources for other industries. Even at the household scale, using less and reusing more can reduce the amount we send to landfills each year.

This plan envisions a future where Kalamazoo creates self-sustaining, non-linear food and waste systems that are more resilient to external forces. The community benefits by becoming more resilience, growing nutritious food options, increasing public health, and creating jobs. The CSP calls for further investment in businesses and systems that recover waste as a resource. Growing Kalamazoo's position as a waste recovery leader will benefit the local economy, increase jobs, and reduce landfill waste.

To achieve this vision, two broad goals have been set forth:

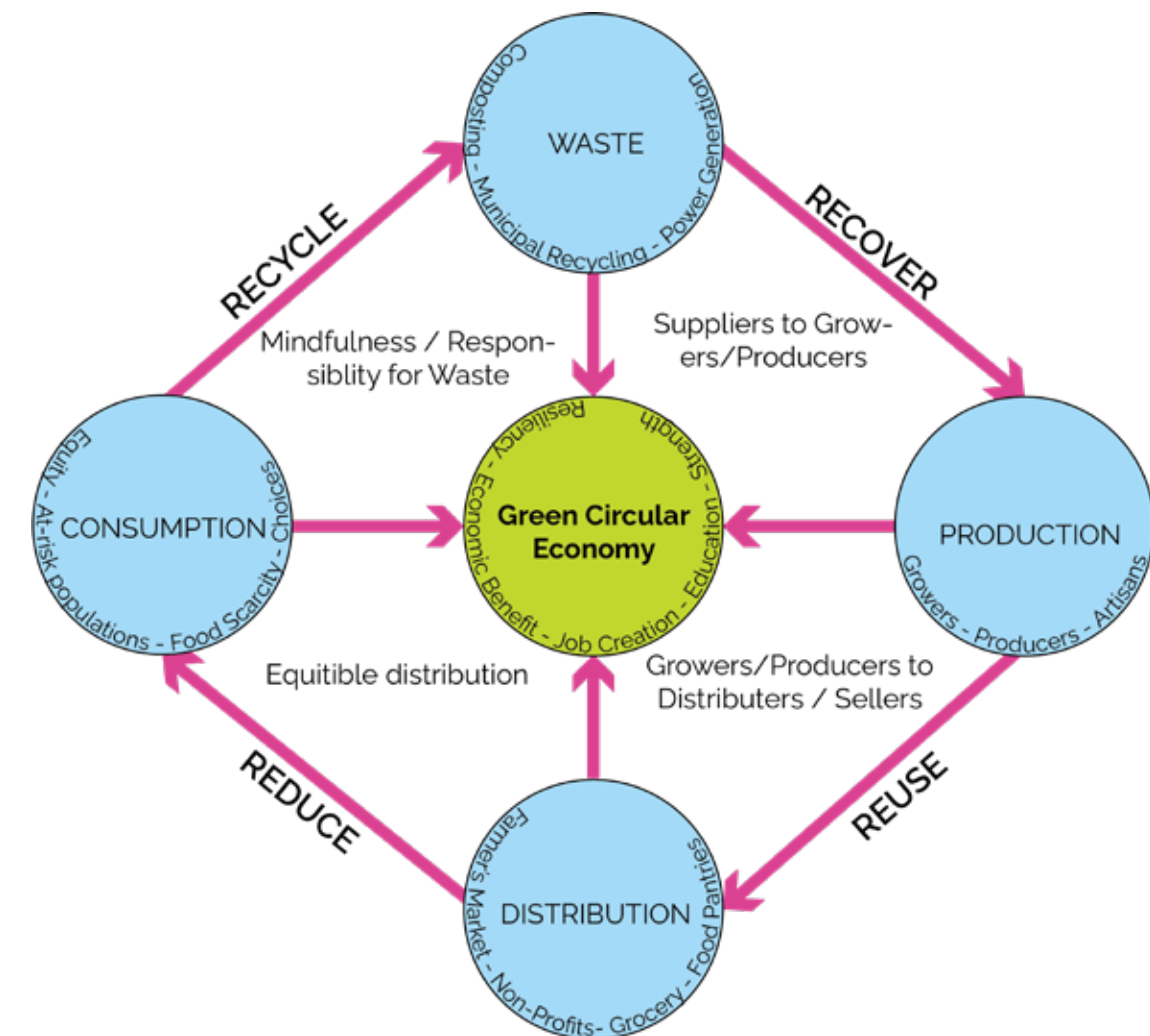
- Support systems for local food production and distribution on multiple scales
- Reduce community waste and support market solutions for waste diversion and recovery

Introduction

This chapter focuses on food system and waste management sectors in Kalamazoo. The current linear supply chain system is unsustainable – produce, use, dispose. A new, more sustainable model is emerging. The circular economy aims to keep resources in use for as long as possible (FAO, 2019; Secon, 2020). Instead of landfilling, products and materials are regenerated at the end of their service life.

The Kalamazoo community is a leader in the local food movement. There is strong community interest at many levels, from residential to institutional. Sourcing more of our food locally can help with circularity and reduce carbon emissions. It has the added benefits of business growth and healthy food access.

Kalamazoo has a strong recycling economy. For many decades, local paper plants have recycled and



manufactured paper products in Kalamazoo. Kalamazoo is home to several metal recycling companies. Higher education and other institutions compost food waste from cafeterias and dining halls.

Understanding Food and Waste in Kalamazoo

Food Systems

The modern U.S. food system is extremely complex, though it is primarily a linear system (Guenard, 2020). Food travels in one direction, from production and processing to consumption and disposal. The system requires high amounts of resources to grow food, including fossil fuels. Food waste is then disposed of and generates significant amounts of pollution through landfilling (Charles, 2020). While growing food is closely connected with nature, the linear food system can be incredibly hard on the environment. Modern agriculture and traditional farming practices contribute to soil erosion, water quality decline, deforestation, and carbon emissions (Tubiello et al., 2021).



Food scraps added to the compost pile at The Bike Farm, a composting business in Kalamazoo.

A green circular economy reduces waste and works to improve the environment. The circular economy aligns closely with the City's strategic vision for environmental responsibility and economic vitality. An example of the community's interest and support of local food is through the City's partnership with PFC.

In 2021, PFC, City, and partners worked on the expansion of the farmer's market. The project enhances and expands facilities for the market as part of a commitment to foster a growing community of farmers and help residents access fresh, locally produced food in a safe, accessible, and vibrant location. With growers, producers, retailers, and artisans included in the make-up of the farmers market, Kalamazoo has a solid base from which to expand its green circular economy and could build a culture of cultivation similar to what is happening elsewhere in Michigan (Burk, 2021).

Waste Management

Residents and businesses in the City rely on private waste management companies for trash service.

The City operates a single stream, curbside recycling program supported by a solid waste millage. The City also operates a composting site for yard waste, but there are few opportunities for composting household food waste.

Large institutions and businesses who choose to compost organic waste typically use a private vendor. The closest commercial-scale composting vendor to Kalamazoo is located outside of Lansing. The demand side for the circular economy is growing, creating opportunity in Kalamazoo for the supply side.

Strategic Direction

One key component of a thriving circular economy is a local food system that supports production, distribution, and consumption at multiple scales. The CSP focuses on a strategy of support to help partners working in this space.

- **Programs and policies** that assist residents in growing food for their own nutrition or to share with neighbors
- **Opportunities** for small-scale market gardening and farming that facilitate sales of crops from small urban farmers directly to consumers
- **Incubators and incentives** that build a supportive climate for small, locally owned value-added food businesses
- **Systems that support** the distribution of larger quantities of locally produced foods from farms and manufacturers nearby

The CSP looks for ways to support and connect local

The most recent Community Health Needs Assessment found that access to affordable, healthy food was a barrier identified by survey respondents.

food with the materials recovery sector in Kalamazoo. This work will require more partnerships between the City, state, community organizations, and institutions. Several City services intersect with the waste recovery sector.

- Residential curbside recycling program
- Sanitary waste and water reclamation
- Yard waste composting service
- Bulk trash pick-up service

Progress toward the goals in this chapter will be tracked annually through the CSP process using key performance indicators in Chapter 6.



Contributing over \$100 billion annually to Michigan's economy, the food and agriculture sectors in Michigan employ the largest portion of the state's workforce. (MSU Center for Agriculture & Natural Resources, 2020, 2021)

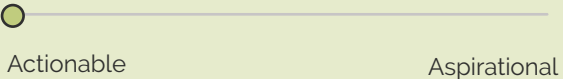
Goal: Support systems for local food production and distribution on multiple scales

Align local policies with the circular economy

ACTIONS:

- Review and amend the zoning ordinance to ensure food can be grown locally at all scales
- Amend zoning ordinance to permit sale of gardening/agricultural goods in appropriate zoned districts

FEASIBILITY: Priority to Launch



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Connect residents to local, regenerative food opportunities and education

ACTIONS:

- Support local food production at the individual and neighborhood level (e.g., vertical gardening, hydroponics, and urban farms)
- Attract fresh healthy food providers, vendors, and markets to neighborhood corridors
- Pursue public-private partnerships and models to produce food in more places

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

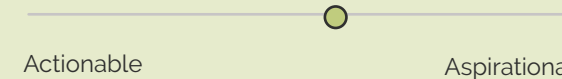
COST: \$ \$ \$ \$ \$

Support local food incubators and innovation hubs

ACTIONS:

- Seek funding and partnerships to increase infrastructure, workforce training, and economic development tools to support local food industry
- Allow small-scale composting and other green businesses within the city in residential and commercial districts

FEASIBILITY: Opportunistic



CITY ROLE:

- Act Connect Advocate

TIMELINE:

- Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Goal: Support Systems for Local Food Production and Distribution at Multiple Scales

While there are many actors in the food system, municipal government does not play a direct role. This goal in the CSP recognizes the need to support existing stakeholders in the local food movement. The strategies below provide an opportunity for the City to act as connector and resource. There are several unique opportunities the City can leverage in support of local food.

- **Local Regulation and Zoning.** Aligning the zoning code to allow more food production and growth in more places throughout the City.
- **Relationships with Neighborhoods.** Using the City's support role in implementing neighborhood plans to connect interest and increase opportunities.
- **Economic Development and Shared Prosperity.** Leverage economic development efforts and incentives to support job creation, business development, and skills training with a focus on shared prosperity and core neighborhoods.

STRATEGY

Align Local Policies with the Circular Economy

Purpose

The purpose of this strategy is to perform a close examination of the various City ordinances and policies. Potential conflicts will be revised or removed to enable activities like local food production and composting. There are several opportunities that intentional zoning and ordinance changes can accomplish:

- Allowing more gardening and food or agricultural businesses by right in appropriate areas of the City
- Removing barriers or creating programs to provide equitable access to public infrastructure and resource access
- Using zoning or other ordinances to attract more



healthy food options to neighborhoods and commercial corridors

Actions

Review and amend the zoning ordinance to ensure food can be grown locally at all scales. The City will evaluate the Zoning Ordinance and other regulations to understand limitations in local food production. Conflicts will be addressed through amendments and zoning changes. Opportunities to increase food production or composting at various scales will be identified and solutions brought forward to neighborhoods and stakeholders for closer consideration. The desired scale of gardening and agriculture may vary by neighborhood and zone district to strike a balance between circular economy and other quality of life goals.

Amend the zoning ordinance to permit sale of gardening and agricultural goods in appropriately



zoned districts. Marketing and selling of agricultural goods should be allowed by right in appropriate areas of the City. Similar to the ordinance and policy review, the City will evaluate zoning districts and other regulations to expand where food and gardening sales should be allowed or permitted (Bosse, 2021).

STRATEGY

Connect Residents to Local, Regenerative Food Opportunities and Education

Purpose

Local food is a central part of our culture and has a strong presence in the Kalamazoo community. There are many active stakeholders working on all aspects of local food, from food innovation hubs and incubators to markets and community gardens.

The purpose of this strategy is to position the City

as a connector to engage new groups in the local food economy on both supply- and demand-side. Residents, neighborhood and business groups, and community-based organizations can collaborate with City departments to build and demonstrate demand. This can help attract the food businesses to neighborhood commercial corridors that have been identified in many neighborhood plans.

Actions

Support local food production at the individual and neighborhood level. In 2021, the Kalamazoo Valley Community College ValleyHUB, City government, and neighborhood associations launched a new container gardening initiative. The Kalamazoo Roots program provides free instruction and gardening supplies to residents of the Eastside, Vine, and Oakwood neighborhoods. These neighborhoods had identified gardening as a priority to address food insecurity and self-sufficiency in their neighborhood plans.

The City will support this action by expanding Kalamazoo Roots to other neighborhoods. The City will seek to support similar collaborations. The target outcome is sharing education and resources to build community within neighborhoods around food.

Attract fresh healthy food providers, vendors, and markets to neighborhood corridors. Most of the approved neighborhood plans have goals around local, fresh food. Whether attracting fresh food vendors or adding more fresh food to existing stores, there is a strong demand for healthier and more local food. The City will use economic and community development models and tools to support

KALAMAZOO ROOTS

Kalamazoo Roots is a free container gardening class created in partnership between the City, Kalamazoo Valley Community College ValleyHUB, and neighborhoods, with funding from the Foundation for Excellence.

The program was launched in 2021 and the City plans to continue expanding the program and seeking to support similar collaborations. The program provides container gardening kits, plant starts, instructional videos, and Q&A sessions.



neighborhoods in implementing their plans for more food offerings. Funding from the Foundation for Excellence made programming like this possible to support local food production in neighborhoods. The partnership with KVCC aims to promote skill development for interested residents and jumpstart or sustain efforts within the neighborhoods and beyond. What the program provided was capital to promote and support efforts that may bring lasting change. This formula will be important moving forward.

Pursue public-private partnerships and models to produce food in more places. While a core part of our culture, food production can be quite removed, even absent, from urban living. Many collaborative efforts like community gardening have taken root in Kalamazoo. We can expand opportunities by utilizing public land for food production in the appropriate places.

The City is a major landowner within Kalamazoo. In that role, the City will explore opportunities and frameworks to allow more food production in more public spaces. Ordinances and policies should provide other public landowners the opportunity to grow food in innovative ways and at multiple scales.

STRATEGY

Support local food incubators and innovation hubs

Purpose

The purpose of this strategy is to help meet Kalamazoo's demand for local food by supporting

local food entrepreneurs. Incubators and innovation hubs offer affordable entry into markets that do not make financial sense for small and micro-businesses. Start-ups often need training in business management, marketing, and legal services to be successful. Supporting new business growth can help support neighborhood and commercial corridors, giving residents more choices for local, healthy foods.

WHAT'S HAPPENING NOW

Food HUB

Kalamazoo has one of only eight food hubs in the state. ValleyHUB is a farm, food hub, and education center at Kalamazoo Valley Community College's Food Innovation Center. The hub distributes fresh foods from over 30 locally owned businesses to retail stores, restaurants, and cafeterias like Bronson Hospital.

Food Incubator

Kalamazoo also has a food business incubator. Can-Do Kitchen helps local start-ups remove barriers to food business ownership through education and access to commercial kitchen space.

Food hubs serve a key role in developing local, circular food systems. A food hub serves as the active manager to aggregate, distribute, and market food products from local and regional producers. This gives smaller producers the ability to collectively meet wholesale, retail, and institutional demand (USDA, 2013). On their own, these businesses might not be able to satisfy demand of buyers or be profitable due to scale.

Food incubators support small food business entrepreneurs. They offer shared commercial kitchen space at affordable rates to food production and specialty businesses. Incubators often have wrap around training in how to run a business and bring products to market.

Actions

Support collaborations that increase infrastructure, workforce training, and economic development tools to support the local food industry.

The existing food hubs and incubators in Kalamazoo showcase how local support and resources can accelerate new business development. The City will look for partnership opportunities to lend support to innovative accelerator programs like these. A parallel objective is supporting partners who leverage education and workforce training programs as part of incubator and accelerator models.

This action provides an opportunity to connect to Shared Prosperity Kalamazoo (SPK) initiatives to support small business development in historically disinvested neighborhood and commercial areas. The City will continue to support funding requests to

connect financial resources and unique stakeholders. As businesses grow and need new space or opportunities, the City's business development programs can be positioned to offer specialized assistance.

Allow small-scale composting and other green businesses within the city in residential and commercial districts.

The City will work with a range of businesses and community organizations to explore market opportunities for composting and other green businesses. Zoning codes and other policies will be evaluated and amended to allow small-scale operations in appropriate zoning districts. The City will explore comparable communities and institutions where successful yard and food waste composting programs have been established to build local opportunities.

A recent survey of Michigan food employers reports 41% currently have job openings. They pointed to lack of workplace skills (31%) and transportation (26%) as the top two hiring challenges employers experience (MSU, 2020, 2021).

COMPOSTING 101

Composting is a process that takes organic waste such as food scraps and breaks them down into an organic material called "compost" that can be used as a natural fertilizer.

Benefits of Composting

- When food scraps break down in a landfill they release the potent greenhouse gas methane. Keeping food scraps out of the landfill and converting them to compost instead can help reduce methane emissions.
- Finished compost can be used as a natural fertilizer for soils and gardens, which cuts back on chemical fertilizer usage. Compost helps create healthy soils and increases water retention in soils.
- Food and garden waste can make up over a third of household waste. Both buying food that goes to waste and waste disposal are expensive. By composting at home, you reduce the need to collect, process, treat and dispose of biodegradable materials. This saves landfill space and transportation fuel.



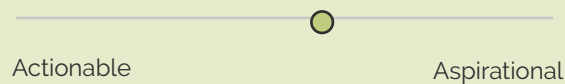
Goal: Reduce community waste & support market solutions for waste diversion and recovery

Expand community recycling

ACTIONS:

- Increase participation and volume of material collected in curbside recycling program
- Expand alternative recycling and reuse opportunities

FEASIBILITY: Opportunistic



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

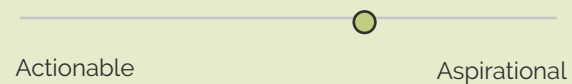
COST: \$ \$ \$ \$ \$

Support new policies and market-based solutions for waste diversion and recovery

ACTIONS:

- Update zoning ordinance to allow small-scale composting in residential and commercial districts
- Work with partners to promote repair over replace
- Incubate inclusive opportunities for material supply chain and end markets

FEASIBILITY: Horizon



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Work toward sustainable City facilities focused on resource recovery

ACTIONS:

- Build interdepartmental sustainability committee to review policies and operationalize green practices
- Complete waste stream audits for City departments
- Determine viability of biosolids management alternatives to increase resilience and control costs

FEASIBILITY: Opportunistic



CITY ROLE:

Act Connect Advocate

TIMELINE:

Short Mid Long Extended

COST: \$ \$ \$ \$ \$

Goal: Reduce Community Waste and Support Market Solutions for Waste Diversion and Recovery

Kalamazoo has a strong interest in reducing waste and recycling. In 2019, City Commission made a proclamation that the City join the state's recycling challenge. The State of Michigan has a goal of doubling its recycling rate to 30% by 2025. In support, the City set a goal of collecting 2,500 tons of housing materials annually by 2025. The City's curbside recycling program continues to gain participation. In 2021, City residents collected over 2,215 tons of materials for recycling.

In addition to recycling, this goal will require programs that support reusing or reducing waste. Strategies focus on supporting efforts within the community to divert waste from landfills and address limitations in



the recycling market. This includes food waste, as well. The community has expressed a strong interest in more opportunities for community composting. This strategy aims for long-term outcomes to develop a new, small-scale industry in the City and attract market expansion to Kalamazoo from larger composting vendors in the state.

STRATEGY

Expand Community Recycling

Purpose

The purpose of this strategy is to continue to find innovative ways to recycle more household waste. Kalamazoo has strong residential participation in the curbside recycling program. The Community Sustainability Survey asked a variety of questions about people's interest in environmentally friendly actions. Over 82% of respondents said they already recycle at home. This was the highest implementation rate of the 15 actions asked in the survey.

To meet statewide goals, Kalamazoo must find ways to increase curbside recycling by 10% annually by 2025. This strategy also seeks to expand recycling by finding new materials and markets to collect beyond what goes into the curbside container.

Actions

Increase participation and volume of material collected in curbside recycling program. As part of the Kalamazoo Recycling Challenge, the City will work with state and local partners to implement the "Know It Before You Throw It" campaign to promote best

practices and increase recycling volumes. Getting contamination data from the vendor will be important to understand measures of success. The City will work to increase participation of customers and amount of material collected. The overarching goal is 2,500 tons of recycled materials collected each year.

Expand alternative recycling and reuse opportunities.

In 2021 the City supported a community-based pilot to recycle #6 expanded polystyrene (EPS) foam. An initiative like EPS recycling is an example of how new partnerships and volunteer capacity can help recycle materials not accepted by traditional recycling markets. From the collection events in 2021, the program collected over 700 cubic yards of EPS foam. The City will continue to pursue partnerships to explore and implement unique recycling and reuse opportunities.



STRATEGY

Support New Policies and Market-Based Solutions for Waste Diversion and Recovery

Purpose

The purpose of this strategy is to align the City's zoning ordinance and other policies to support different scales of waste recovery. The City will seek partners to help residents reduce and reuse materials to save on waste.

Composting food waste can be done at different scales and with different methods. Nearly anyone can compost household food waste with the right set up in the backyard. Larger commercial-scale operations will require more space and be subject to state laws.

The City's zoning ordinance can serve as a guide for directing the proper use to the right location in the City.

Actions

Update the zoning ordinance to allow small-scale composting in residential and commercial districts to encourage micro-scale market development. The City will evaluate and amend the zoning ordinance and other codes to ensure composting is allowed in appropriate zoning districts at multiple scales.

Work with partners to promote repair over replace. Members of the steering committee and focus groups identified residential waste reduction as an important community priority. The City will act as connector to bring together neighborhoods and partners like the public library to enhance lending and borrowing programs. This type of program allows free use of tools and supplies residents do not need to buy and then store or disposal of later. This program model can benefit other CSP actions like home gardening. A seed library and garden tool lending program would give community members access to shared resources for more food.

Incubate inclusive opportunities for material supply chain and end markets. Businesses in Kalamazoo are joining the NextCycle Michigan program to develop innovative partnerships to recover waste from industry and other sectors. Regional partners and economic development groups are also seeking opportunities to incubate ideas to grow Kalamazoo's recycled materials supply chain and end markets. The City will provide municipal support toward economic

COMPOSTING CHALLENGES

Market size and feedstock issues are a common challenge for the recycling industry. Strong community collaboration will be needed to overcome these barriers when it comes to commercial-scale composting.

Most composting efforts will need regional and state support. Commercial-scale composting is a heavily regulated industry and large-scale facilities will likely look for space outside of the City.

Attracting commercial-scale composting facilities can be challenging due to poor public perception related to odor, water quality impacts, and traffic. Creative community strategies will be necessary to explore the viability of micro-scale composting at the City and neighborhood scale.

development and as an industrial operator.

STRATEGY

Work Toward Sustainable City Facilities Focused on Resource Recovery

Purpose

The City has an opportunity to model the behaviors and practices needed to reach this goal within its own facility footprints. The top priority will be implementing waste reduction and local procurement to support a green circular economy within buildings owned by the City. Some changes to public utilities and assets like the wastewater system will require buy-in from regional customer communities and industries. Implementing system changes will require more time and planning to complete assessments across the value chain to balance permit requirements, costs, and desired sustainability outcomes.

Actions

Build interdepartmental sustainability committee to review policies and operationalize green practices.

A sustainability committee or "green team" will be organized within and between departments. The teams will spearhead change and implement ideas that improve office habits and behaviors starting with solid waste. Teams will expand scope over time to work on practices like reducing office energy waste, greening employee commutes, and starting bike share programs.

Complete waste stream audits for City departments.

Beyond employee behaviors and practices, building waste stream audits target waste reduction from

City services processes. This long-range activity will require auditing tools or consultants to evaluate processes and recommend new practices, procurement, waste recovery, and supply chain efficiencies.

Determine the viability of biosolids management alternatives to increase resilience and control costs.

The City of Kalamazoo Water Reclamation Plant provides treatment services to more than 194,000 residents in 18 Kalamazoo-area municipal jurisdictions. The plant uses an innovative treatment system to treat a variety of pollutants in concentrations that most other plants cannot. Manufacturers that produce pharmaceuticals, organic chemicals, spices, and food additives all benefit from this process.

Biosolids are a product of the wastewater treatment process. The City has used both beneficial biosolid land application and landfilling to safely dispose of biosolids. The City will continue to evaluate and explore alternative management ideas to balance risk, cost, and environmental benefits. The City will consider management techniques like those that capture energy from biosolids through innovative technology and partnerships.



Implementation

Introduction

This 10-year guiding document supports the long-term actions needed to create a more sustainability and resilient community. The full action table provided in this chapter describes a robust list of 81 actions organized into 29 strategies that are designed to achieve 10 community goals for sustainability. The table will serve as a work plan for City departments. It identifies government role, timeline, cost range, lead department, and potential collaborators for strategies and actions.

The Community Sustainability Plan (CSP) is intended to be a 'living' document. It will be regularly reviewed and aligned with updates to the City's strategic vision, master plan, and other related plans. The iterative review process will consider advancements in technology and policy, measured progress, and key funding opportunities that arise. The goals, strategies, and actions are not listed in a linear step-by-step process.

While the goals will remain the same, the strategies and actions are meant to be flexible in implementation. This allows the CSP to be adjusted as external forces change. Over time strategies and actions will be added, modified, or removed based on progress and the City's annual budget process. Ongoing staff participation in local, regional, and statewide committees and convenings will help maintain the CSP as a relevant and actionable plan.

The triple bottom line of sustainability involves broad topics that will require ongoing interdepartmental cooperation to successfully implement. A key initial step in the implementation of the CSP is the creation of an interdepartmental working group. This working group will provide ongoing leadership and coordination for the implementation of both the CSP and other reports and plans related to sustainability.



Priority-based Implementation

The CSP has 81 actions that will support and advance 29 strategies toward sustainability goals. The goals serve as guideposts for sustainability that will remain over the life of this plan. Strategies are targeted plans of action to meet these goals and are likely to shift in some ways. The actions listed in the plan are best recommendations at this time but are highly subject to change through an adaptive planning process of tracking progress and refining actions.

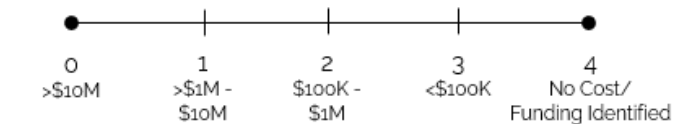
Scoring Framework

The feasibility score was developed at the strategy level. It factors in three key feasibility indicators. Every strategy was given a score for each indicator. Those three scores were then summed to develop the feasibility score for a total of 0-14 total points.

- **City role or level of influence** (0-4 point range)



- **Cost range** (0-4 point range)



- **Implementation timeline** (0-6 point range)



Feasibility scores were divided into three categories that are included in the action table.

1. **“Priority to launch”** are strategies with feasibility scores of 8 or greater. Seven of the 28 strategies are considered “priority to launch”. They include projects and actions that the City can lead at no or low cost or where funding is already identified. Strategies in this category have community or partner support and are well-timed.
2. **“Opportunistic”** are strategies with feasibility scores between 6-7. Twelve strategies fall within this category. They are missing key elements before they can be launched, including the need for new partnerships, policy support, technology, or significant funding. Some of these projects will start within the timeframe of this plan but may stretch into a future planning period. If certain opportunities arise, like new unanticipated funding becomes available, these projects should be well positioned to move up the priority list to launch.
3. **“Horizon”** are strategies with feasibility scores less than 6. There are 9 strategies in this category. They have a combination of very high costs, require external leadership, or will require extended time periods to complete. Like the opportunistic category, these projects are still priorities but need a better fiscal, technological, or legislative environment to significantly lower implementation cost in time and money. They are further off on the horizon but are included in this plan to keep them in view. Early actions will be taken to prepare for future implementation.

While important, feasibility is only one factor used to prioritize strategies. A second prioritization score was developed to help weigh priorities. This score captures the relative value of a strategy to mitigate climate change or help the community adapt. Each strategy was given points for climate mitigation potential (0-6 point range) and community adaptation potential (0-6 point range) for a total of 12 possible points. The total climate score was factored together with the feasibility score to understand intersecting priorities.

Six Strategies for Sustainability

Using the prioritization process, the CSP identifies six top strategies for sustainability. They represent opportunities to jump start implementation in 2022 and bring about significant outcomes. These strategies had the highest combined priority scores from each sustainability theme. They align well with community input from the sustainability survey, steering committee, and other plans. All but one ranked as "priority to launch" in the feasibility category. The community health strategy ranked as "opportunistic" due to funding needs. Strategies from the Affordable Efficient City theme all received the highest climate score.

High Priority Wait List

It is important to recognize that some strategies with low feasibility scores represent good opportunities for climate mitigation or adaptation. Some of these strategies, especially those with extended timelines, have actions that can and must be accomplished in

the near-term to continue to make progress toward completion. A short list of this type of strategy has been placed on a "High Priority Wait List". Projects on this list have some level of progress or plans in the near term or are critical to climate mitigation or adaptation. These projects will be evaluated regularly to identify any opportunities to continue their progress when long-term completion is still anticipated.

Financial Resources

Some of the actions in this plan are already integrated into existing City plans, polices, and processes. They are supported by existing staff capacity and may not require new financial investment. Rather the actions can be implemented by adding sustainability considerations into existing programs and decision-making processes. Other actions in the CSP are new or include enhancements to existing City programs. They will require new financial investment. To minimize cost and maximize value for taxpayers, staff will work closely with City departments and management services to develop an annual, incremental funding approach to implement the plan over time.

For actions where a new financial investment is required, staff will use business cases to evaluate long-term cost savings, co-benefits, and return on investment timeframes. In many cases, innovative financing and revenue generating mechanisms will be necessary to advance a strategy. This could be developing or expanding partnerships and pursuing external funding opportunities like grants. Ongoing

Top Six Strategies for Sustainability		Chapter Theme
	Strategy: Remove barriers and develop tools that lead to more solar deployment	3
	Strategy: Align local policies with the circular economy	5
	Strategy: Encourage density for more sustainable land use	2
	Strategy: Invest in programs that protect community health	4
	Strategy: Retrofit and weatherize existing buildings to reduce energy waste	3
	Strategy: Pilot a community solar project	3

High Priority Wait List	Chapter Theme
Strategy: Mitigate flooding to protect people and property	4
Strategy: Equitably increase the tree canopy	4
Strategy: Electrify City light-duty fleet	3
Strategy: Invest in resilient stormwater infrastructure	2

review and assessment of financial resources and staff capacity will inform funding requests and recommendations to be brought forward to City Management.

Measuring Success & Tracking Progress

The goals of this plan are visionary and values-based. To track progress, it is important to measure several key performance indicators (KPIs) to track progress toward the 10 goals. Measurable targets will help staff monitor progress and success. Ultimately, the City must work toward science-based carbon reduction targets. This will require inventories at regular intervals to understand progress toward the overarching goal of carbon neutrality.

Measuring Our Carbon Footprint

As strategies in the CSP are implemented, we will see carbon savings over time. It will become important to measure and track progress based on this carbon savings. Without this standard metric to measure against, progress could become distorted. For example, our energy bills may go down after installing home energy improvements. Yet once we start plugging electric vehicles in at home, the bill will show greater electricity use. This is where measuring our carbon footprint will become valuable because this example saves a lot of carbon but appears to use more electricity. Burning fossil fuels is one of the highest carbon emitters, so switching to electric is an instant carbon savings.

In 2014, Western Michigan University helped the City calculate its carbon footprint. The inventory was done using the ICLEI Clear Path online calculator. It included estimates of carbon coming from fleet vehicles, buildings, street and traffic lights, and transit busses. In that year the City was responsible for around 42,000 metric tons of CO2 equivalent. The inventory did not include emissions from wastewater, biosolids management, and other waste.

In 2021, the City worked with a Virginia Tech University graduate program to calculate a community-wide inventory. The inventory relies on data from regional partners to account for things like vehicle miles traveled, buildings electric and gas usage, water and wastewater, and solid waste. In working with partners, we found several data gaps. Some of the data was not measured in a way that could be accurately plugged into the inventory calculator. This effort helped us understand the need to build better partnerships and systems for data collection.

Regional collaboration on carbon tracking presents a unique opportunity for meaningful collaboration.

- **Our carbon footprints overlap.** Across the region, sector-level carbon emissions like transportation networks and utilities cross jurisdictional lines. For example, the City's sanitary sewer utility owns data for customers throughout the County.
- **Together we have more capacity.** Communities throughout Kalamazoo County have real staff and resource limitations. Data gathering, analysis, and reporting can be more efficient and accurate at scale.

- **We gain opportunities for idea sharing.** Climate change does not recognize jurisdictional boundaries. Tracking carbon together will help build collaboration toward shared problems and shared solutions.

Sustainability Certification

The City has been an active member of the Michigan Green Communities program. It is a statewide sustainability benchmarking, networking, and technical assistance program. It is supported by the Michigan Economic Development Corporation and Departments of Environment, Great Lakes, and Energy; Health and Human Services; and Transportation (MDOT) with collaboration from the Michigan Association of Counties, Michigan Municipal League (MML), and Michigan Townships Association.

In 2019, the City earned bronze-level sustainability certification. The City will continue to collect data and track progress toward the MI Green Communities Challenge. This organization serves as a community of practice and network for the City. The goal is to increase certification to the gold level by 2027.



WHAT'S HAPPENING NOW

BIODIESEL PILOT PROGRAM

In summer 2021, the City kicked-off a biodiesel pilot program to reduce emissions from City vehicles. This fuel blend could reduce Kalamazoo's fleet emissions by 20 tones each year. The pilot will test vehicle performance in cold and hot weather using different biodiesel blends.

The pilot is a great example of how sustainability can benefit from regional partnerships. The City of Portage is joining Kalamazoo's pilot program. Through a cost-sharing agreement, Portage vehicles will test the biodiesel blend to decide if the switch will work permanently for their fleet.

Through the Michigan Green Communities Challenge, the City seeks to earn Gold Certification for Municipal Sustainability by 2027.

Key Performance Indicators

The City will track progress toward our goals by measuring Key Performance Indicators (KPI). KPIs are targets for environmental and community metrics and are shown in the KPI table. In some cases where a numeric value is not available, a desired trend may be set instead. For many strategies, the "completeness" of the tasks will be considered each year to show progress and identify areas where more focus is needed.

KPIs will be reviewed regularly to ensure high-quality data are available, best practices are used, and challenges are identified. Staff will give regular reports to City Commission and other boards to report progress and refine priorities over time. The IK website offers an opportunity to develop a "dashboard" for sustainability tracking. A mid-term check in of the CSP will happen at the 5-year mark to formally address changes in strategies or priorities.

Continual Engagement through Implementation

During engagement for the CSP, there was not equal participation from neighborhoods and demographic groups across the City. The engagement work for this plan is not complete. The City will continue to seek input and leadership from neighborhoods and community groups during implementation of the CSP. All efforts toward the CSP must work to make participants feel welcome, valued, and included in our projects and initiatives.

Inclusive Engagement

Communities and neighborhoods in Kalamazoo have diverse and unique goals and concerns. Work toward CSP goals must acknowledge that each place and group will have influence over the process and an opportunity to shape and lead.

Inclusive engagement means:

- **Building Relationships.** Key individuals and constituents must be involved in the process from the beginning. Projects must be informed by the goals and objectives of a specific community to meet their needs and desires.
- **Make it accessible.** It is critical to address real barriers to participate in sustainability actions. Language, jargon, and narrow outcomes can alienate people. Location, timing, and considerations for things like child care can make it possible for more people to participate.
- **Partnering with diverse organizations and groups.** Inclusive engagement means building partnerships with groups not traditionally or formally affiliated with sustainability. Many groups

Key Performance Indicators for Success

Key Performance Indicator	Current Condition	Desired Trend for Target (2032)
Accessible Complete Network		
KPI 1 - Number of active transportation miles completed	In-Progress*	Trend-up
KPI 2 - Number and distribution of public EV charging stations	111	Increase by 100%
Affordable Efficient City		
KPI 3 - Percentage of households who use electric space heating	20%	40%
KPI 4 - Number of City-supported net zero energy projects completed	0	200
KPI 5 - Number of solar PV array projects approved	In-Progress*	Trend-Up
KPI 6 - Number of EVs in the City Fleet	0	100
Healthy Prepared Community		
KPI 7 - Number of new street trees planted	500	3,000
KPI 8 - Percentage of identified non-copper (lead) supply lines replaced in the drinking water system	25%	75%
Green Circular Economy		
KPI 9 - Number of residents participating in City-supported local food programs	100	2,000
KPI 10 - Amount of materials recycled through curbside program	2,215 tons annually	2,500 tons annually

*In-Progress = Inventory of current condition in-progress

have broad interests that involve environmental, sustainability, and community topics.

- **Be present within the community.** Explore unique opportunities that allow community members to become leaders in a project or initiative. This could involve paid employment or stipend opportunities.

Diversity and Equity

Sustainability and environmental causes are often recognized as lacking racial diversity. Sustainability work not only benefits from more participation from BIPOC communities (Black, Indigenous, and people of color) but climate change disproportionately impacts these communities. We need to support efforts to bring more opportunity for everyone to engage in the climate and sustainability work of our City. Giving people who more closely represent their communities the opportunity to lead will build a more diverse movement and lasting outcomes.

SUSTAINABILITY ACTION TABLE

GOAL Design a greener transportation network that easily and safely connects all users to places they need to go

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Ensure the non-motorized network is connected and accessible year-round	OPPORTUNISTIC	ACT/CONNECT	\$\$\$\$	EXTENDED	2025 MASTER PLAN		
Implement and improve the City's non-motorized plan		Act		Mid-term		CPED - P	PS - PW
Complete a network assessment for accessibility with disability		Act/Connect		Mid-term		PS - PW	CPED, CSAC, DNSWM
Evaluate and upgrade intersections for clearer connections and safety for all users around priority amenities		Act		Extended		PS - PW	CSAC
Pilot a sidewalk clearing program		Act		Short-term		PS - PW	CPED, CSAC
Encourage, educate, and enforce clearing through engagement		Act/Connect		Short-term		CPED - P	CSAC
STRATEGY: Design context sensitive streets safe for all modes of transportation	OPPORTUNISTIC	ACT	\$\$\$\$\$	LONG-TERM	2025 MASTER PLAN, STREET DESIGN MANUAL, KATS		
Create and implement a traffic calming process		Act		Mid-term		CPED - P, CI	PS, CSAC
Implement street design guides to ensure context sensitive streets, enabling safer, more comfortable travel for all users		Act/Connect		Long-term		PS - PW	CPED, CSAC, KATS
STRATEGY: Increase EV charging infrastructure and ensure access is robust and equitable	PRIORITY TO LAUNCH	ACT	\$\$\$	MID-TERM	STREET DESIGN MANUAL		
Add EV charging design elements to the Street Design Manual for downtown, commercial corridors, and neighborhoods where residents rely on street parking		Act		Mid-term		CPED - P, CI	PS - PW
Accelerate investment in EV infrastructure through incentives, reducing barriers, and innovative public solutions		Act/Connect		Mid-term		CPED - P, CI	PS - PW
STRATEGY: Invest in resilient stormwater infrastructure	OPPORTUNISTIC	ACT	\$\$\$\$	LONG-TERM	STORMWATER MGMT PLAN		
Develop a stormwater master plan		Act		Mid-term		PS - PW, WD, WWD	CPED
Create revenue sources to maintain stormwater system and increase GSI		Act		Long-term		PS - PW, WD, WWD	
Pilot green stormwater infrastructure for a public streets project, prioritizing climate vulnerable areas		Act		Mid-term		PS - PW	CPED
Revise stormwater and wellhead policies and standards		Act		Mid-term		PS - PW, WD, WWD	

GOAL Strategically increase residential density to facilitate safe, accessible, and equitable travel

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Encourage density for more sustainable land use	PRIORITY TO LAUNCH	ACT	\$	MID-TERM	HOUSING STRATEGY		
Implement the City's housing strategy to maximize density and intensity in appropriate districts and nodes		Act		Mid-term		CPED - CI, P	Housing orgs, Land Bank
Encourage infill by allowing more housing units and types in different zoning districts		Act		Mid-term		CPED - CI, P	Housing orgs, neighborhood assn
Develop pre-approved plans for different housing types		Act/Connect		Short-term		CPED - CI, P	Housing orgs, funding orgs
STRATEGY: Support development that helps people live closer to work and daily needs	OPPORTUNISTIC	ACT	\$\$\$	EXTENDED	-		
Tie density goals to targets that will support transit-oriented		Act/Connect		Long-term		CPED - P	Metro, KATS
Collaborate with large employers and institutions on home ownership opportunities near work		Connect		Long-term		CPED - CI	Businesses, neighborhood assn
Use incentives to support development near employment or public transit and that connects to daily needs		Act/Connect		Extended		CPED - CI	BRA, FFE

GOAL Make transit a more viable option for more trip types and users

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Invest in transit infrastructure to create more efficient, faster service	HORIZON	ADVOCATE	\$\$\$\$	EXTENDED	-		
Determine need, viability, and costs of infrastructure to improve on-time performance and prioritize high frequency routes		Advocate		Extended		Metro	
Invest in bus shelter locations and solar lighting		Advocate		Mid-term		Metro	PS, CSAC
STRATEGY: Increase transit system reliability and availability	HORIZON	ADVOCATE	\$\$\$\$	EXTENDED	COMP OPERATIONAL ANALYSIS		
Complete a Comprehensive Operational Analysis and implement system design improvements		Advocate		Extended		Metro	KATS, PS
Develop new service types such as BRT or workforce transportation programs		Connect		Long-term		Metro	Large employers
Pilot a micromobility project "employees on wheels" service working with employers		Connect		Long-term		Metro	Large employers

GOAL Accelerate local renewable energy investments

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Remove barriers and develop tools that lead to more solar deployment	PRIORITY TO LAUNCH	ACT	\$	SHORT-TERM	-		
Evaluate, amend, and test codes and ordinances to create a streamlined development and permitting process		Act		Short-term		CPED - P	Broad stakeholder group, community partners
Convene an inclusive solar accelerator committee to develop decision-support tools		Act		Short-term		CPED - CI	State, funding orgs, community-based orgs, neighborhood assn, solar industry
STRATEGY: Create partnerships to offer LMI-specific incentives for equitable solar deployment	PRIORITY TO LAUNCH	ACT	\$\$\$	EXTENDED	-		
Actively participate in the EWR low-income workgroup and create local and regional partnerships		Act/Connect		Long-term		CPED - P	Metro, KATS
Leverage funding sources to create a framework for solar deployment in LMI households		Connect		Long-term		CPED - CI	Businesses, neighborhood assn
STRATEGY: Pilot a community solar project	PRIORITY TO LAUNCH	ACT/ADVOCATE	\$\$\$	MID-TERM	-		
Develop a community solar project as a local modes to address energy equity and affordability		Act		Mid-term		CPED - P	PS, CMO, neighborhood assn, housing orgs, solar industry
Join peer communities in Michigan to advocate for state policy that advances community solar and energy equity		Advocate		Short-term		CPED - P	Peer communities, MPSC

GOAL Transform buildings and behavior to save energy and money

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Retrofit and weatherize existing buildings to reduce energy waste	PRIORITY TO LAUNCH	ACT	\$\$\$\$	MID-TERM	-		
Create a robust green affordable housing initiative		Act/Connect		Mid-term		CPED - CI, P	Community-based orgs, CAA, FFE, funding orgs
Improve commercial building performance through energy benchmarking and labeling programs		Act		Mid-term		CPED - P	Consumers Energy, building owners, funding orgs
Benchmark City buildings and develop an energy mangement plan		Act		Short-term		PS (facilities)	Consumers Energy, funding orgs

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Electrify new and existing buildings	OPPORTUNISTIC	CONNECT	\$\$\$\$	MID-TERM	-		
Promote all-electric incentives for new construction, leading with City-supported projects		Act/Connect		Short-term		CPED - CI	Consumers Energy, housing orgs, FFE, funding orgs
Pair electrification with rooftop PV		Connect		Short-term		CPED - CI, P	Community-based orgs, housing orgs, renewable energy sector
Advocate for better state building codes for energy and educate the community about electrification		Advocate		Mid-term		CPED - P	Community-based orgs, peer communities
STRATEGY: Encourage less energy use during peak demand periods	PRIORITY TO LAUNCH	ACT/ADVOCATE	\$	MID-TERM	-		
Continue to implement the City's wastewater treatment plant demand response plan		Act		Short-term		PS - WWD	Consumers Energy
Encourage energy awareness and waste reduction in City offices and facilities		Advocate		Mid-term		CMO	City Depts

GOAL Decrease emissions from City vehicles, equipment, and infrastructure

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Electrify city fleet	OPPORTUNISTIC	ACT	\$\$\$\$	LONG-TERM	-		
Pilot EV fleet vehicles and install initial charging stations		Act		Mid-term		MS, PS - PW	City Depts, State, Consumers Energy, funding orgs
Create and implement a long-term fleet management and EV transition plan for light-duty fleet		Act		Long-term		MS	City Depts, funding orgs
STRATEGY: Invest in energy efficient City equipment and infrastructure	HORIZON	ACT	\$\$\$\$\$	EXTENDED	-		
Select energy efficient and lower emissions options when upgrading and replacing equipment and infrastructure		Act		Long-term		MS	PS - WD, WWD, Procurement
Continue to optimize and automate operation of public utilities		Act		Extended		PS - WD, WWD	
Upgrade public utility assets and infrastructure to target significant energy loads		Act		Extended		PS - WD, WWD	

GOAL Protect the natural environment for urban resilience

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Equitably increase the tree canopy across the City	HORIZON	ACT/CONNECT	\$\$\$\$	EXTENDED	FORESTRY MGMT PLAN		
Use the street tree inventory to update the City's forestry management plan		Act		Mid-term		PS - PW	DNR
Plant more trees community-wide and monitor canopy coverage		Connect		Extended		CPED - P	County, DNR, conservation orgs
Update City tree policies and zoning ordinance to promote "right tree, right place" principles		Act		Short-term		PS - PW	CPED, NFP, tree cmte
Promote better forestry on private property through stewardship and education (NFP Phase 3)		Connect		Long-term		PS - PW	Conservation orgs, Conservation District
STRATEGY: Create opportunities for people to interact with nature and improve biodiversity	HORIZON	ACT/CONNECT	\$\$\$\$	EXTENDED	-		
Manage City-owned natural areas for better ecosystem health		Act/Connect		Extended		Parks, PS - PW, WD	Conservation orgs, CPED
Update zoning ordinance to support more biodiversity		Act		Short-term		CPED - P	NFP
Increase job training and market opportunities for native landscaping		Connect		Mid-term		CPED - CI	Parks, local growers, higher ed
Collaborate on environmental education and stewardship		Act/Connect		Long-term		CPED - P	NFP, conservation groups
STRATEGY: Design the built environment to be more integrated with wildlife	OPPORTUNISTIC	CONNECT	\$\$	LONG-TERM	-		
Develop an inclusive process for the public to gain understanding on wildlife and ecosystem concerns		Act/Connect		Mid-term		CMO	CPED
Monitor wildlife-related data to understand risks and set action levels		Advocate		Long-term		-	ECC
Partner to implement and advocate best practices for urban wildlife protection		Connect		Mid-term		CPED-P	Higher ed, ECC
STRATEGY: Collaborate regionally for better water quality in rivers, lakes, and streams	HORIZON	CONNECT	\$\$\$\$	EXTENDED	WATERSHED MGMT PLAN		
Work with partners to implement watershed management plans, education plans, and best practices		Act		Mid-term		PS = PW, WD, WWD	Conservation groups, State
Prioritize local streams to support daylighting and riparian buffers		Connect		Short-term		PS - PW	State
Create a blue/green trail plan focused on equal access		Connect		Mid-term		CPED - P	Parks, community-based orgs

GOAL Support a healthy and resilient community

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Inform hazard mitigation and preparedness efforts with climate impacts	HORIZON	CONNECT	\$\$	EXTENDED	EMERGENCY OPERATION PLAN		
Align emergency operations plans with climate models		Connect		Mid-term		KDPS	CMO, City Depts
Maintain active participation in the Kalamazoo County Response Consortium		Act		Short-term		KDPS	Gryphon Place, County partners
Promote emergency preparedness plans and support systems for businesses, community organizations, and neighborhoods		Connect		Extended		CPED - CI	Gryphon Place, County partners, neighborhood assn
STRATEGY: Mitigate flooding to protect people and property	HORIZON	ACT	\$\$\$\$\$	EXTENDED	IK 2025 MASTER PLAN		
Develop real-time GIS model for flood events		Connect/Act		Short-term		PS	
Evaluate flood diversion alternatives and design flood mitigation projects		Act		Long-term		PS	
Secure funding to implement flood plain and diversion projects		Act		Extended		PS	
STRATEGY: Invest in programs that protect community health	OPPORTUNISTIC	ACT	\$\$	EXTENDED	-		
Complete drinking water supply line replacements to reduce lead exposure		Act		Extended		PS - WD	FFE
Promote the City's Water Quality Report to provide transparency		Act		Long-term		PS - WD	City Depts
Continue lead abatement programs and incentives for safer buildings		Act/Connect		Long-term		CPED - CI	HUD subrecipients, neighborhood assn

GOAL Support systems for local food production and distribution on multiple scales

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Align local policies with the circular economy	PRIORITY TO LAUNCH	ACT	\$	SHORT-TERM	-		
Review and amend the zoning ordinance to ensure food can be grown locally at all scales		Act		Short-term		CPED - P	Neighborhood assn
Amend zoning ordinance to permit sale of gardening/agricultural goods in appropriate zoned districts		Act		Short-term		CPED - P	Local businesses, community-based orgs

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Connect residents to local, regenerative food opportunities and education	OPPORTUNISTIC	CONNECT	\$\$	LONG-TERM	-		
Support local food production at the individual and neighborhood level		Connect		Mid-term		CPED - P, CI	Neighborhood assn, comm-based orgs, higher ed
Attract fresh healthy food providers, vendors, and markets to neighborhood corridors		Connect		Long-term		CPED - CI	Parks, neighborhood assn, economic development orgs, higher ed
Pursue public-private partnerships and models to produce food in more places		Connect		Long-term		CPED - CI, P	Economic development orgs, Parks, higher ed
STRATEGY: Support local food incubators and innovation hubs	OPPORTUNISTIC	ADVOCATE	\$	LONG-TERM			
Seek funding and partnerships to increase infrastructure, workforce training, and economic development tools to support local food industry		Advocate		Long-term		CPED - CI	Institutions, workforce development orgs
Allow small-scale composting and other green businesses within the city in residential and commercial districts		Connect		Long-term		CPED - P	Community-based orgs, economic development orgs

GOAL Reduce community waste and support market solutions for waste diversion and recovery

	FEASIBILITY	CITY ROLE	COST RANGE	TIMELINE	CROSS-CONNECTING PLAN	DEPARTMENT LEAD	COLLABORATORS
STRATEGY: Expand community recycling	OPPORTUNISTIC	CONNECT	\$\$\$	LONG-TERM	-		
Increase participation and volume of material collected in curbside recycling program		Act/Connect		Mid-term		PS	Neighborhood assn, recycling vendor
Expand alternative recycling and reuse opportunities		Act		Long-term		PS	Neighborhood assn, ECC, community-based orgs
STRATEGY: Support new policies and market-based solutions for waste diversion and recovery	HORIZON	CONNECT	\$\$	EXTENDED	-		
Update zoning ordinance to allow small-scale composting in residential and commercial districts		Connect		Mid-term		CPED - P	Economic development orgs
Work with partners to promote repair over replace		Connect		Mid-term		CPED - P	Community-based orgs
Incubate inclusive opportunities for material supply chain and end markets		Connect		Extended		CPED - CI	Economic development orgs
STRATEGY: Work toward sustainable City facilities focused on resource recovery	OPPORTUNISTIC	ACT	\$\$\$\$\$	LONG-TERM	CAPITAL IMPROVEMENT PLAN		
Build interdepartmental sustainability committee to review policies and operationalize green practices		Act		Mid-term		All Depts	
Complete waste stream audits for City departments		Act		Long-term		PS (facilities)	City Depts
Determine viability of biosolids management alternatives to increase resilience and control costs		Act		Long-term		PS - WWD	Regional partners, customers, State

TABLE KEY

- BRA Brownfield Redevelopment Authority
- CMO City Manager's Office
- CPED Community Planning and Economic Development (-CI community investment, -P planning)
- CSAC Complete Streets Advisory Committee
- ECC Environmental Concerns Committee
- FFE Foundation for Excellence
- IT Information Technology Department
- KPL Kalamazoo Public Library
- Metro Kalamazoo Metro Transit Authority
- MS Management Services Department
- NFP Natural Features Protection Review Board
- Parks Parks & Recreation Department
- PS Public Services Department (-PW public works, -WWD wastewater division, -WD water division)
- SL Sustainability Lead (interdepartmental work group and/or new capacity)
- ZO Zoning Ordinance

Act: City takes a leadership role and has some direct influence over the outcome of the strategy or activity
Connect: City connects sectors to identify partnerships and align work around strategy or activity and may not provide direct resources but contribute to aspects of the activity
Advocate: City will act as guide, resource, or champion for aspects of the strategy or activity

- Short term 1-2 years
- Mid term 3-5 years
- Long term 5-10 years
- Extended >10 years

- Priority to Launch Feasibility score 8-14
- Opportunistic Feasibility score 6-7
- On the Horizon Feasibility score 0-5

- \$ 0-100,000 dollars, or funding committed
- \$\$ >100,000-500,000 dollars
- \$\$\$ >500,000-1,000,000 dollars
- \$\$\$\$ >1,000,000-10,000,000 dollars
- \$\$\$\$\$ >10,000,000 dollars



APPENDIX A

Climate Emergency Declaration

CITY OF KALAMAZOO, MICHIGAN

RESOLUTION NO. 19-59

A RESOLUTION TO DECLARE A CLIMATE EMERGENCY

Minutes of a regular meeting of the City Commission of the City held on October 21, 2019, at 7:00 o'clock p.m., local time, at the City Hall.

PRESENT, Commissioners: Anderson, Cooney, Cunningham, Griffin, Urban, Vice Mayor Knott, Mayor Hopewell

ABSENT, Commissioners: None

WHEREAS, the consensus conclusion of scientific and policy assessments from the Intergovernmental Panel on Climate Change (IPCC) calls for urgent and decisive actions by governments around the world to make "rapid, far-reaching and unprecedented changes in all aspects of society" in order to limit global warming to 1.5 degrees Celsius to avoid the most disastrous impacts; and

WHEREAS, the U.S. Fourth National Climate Assessment detailed the massive threat that climate change poses to the American economy and underscored the need for emergency climate action at all levels of government; and

WHEREAS, the 2019 Assessment of the Impacts of Climate Change on the Great Lakes highlights the significant impacts in our unique backyard. Here in Kalamazoo – and all over southwestern Michigan - we are increasingly experiencing the predicted impacts of climate change including flooding of streets and homes, power outages, and heat waves. Farmers cannot plant or delay planting due to flooded fields. Record low temperatures with snow and ice close schools and businesses. Moreover, these economic and environmental hardships disproportionately affect the most vulnerable citizens of Kalamazoo; and

WHEREAS, over 1,000 local governments in 18 countries have already signed emergency declarations; and

WHEREAS, Mayor Hopewell attended the most recent meeting of the U.S Conference of Mayors where this organization representing more than 1,400 cities issued a resolution declaring a climate emergency. This resolution calls for de-carbonization in time to keep the global rise in temperatures to a 1.5 degree Celsius level and emphasizes that such efforts must involve local governments and their jurisdictions; and

WHEREAS, Mayor Hopewell is one of hundreds of American mayors who signed a pledge to adopt and uphold the 2016 Paris climate agreement goals in an open letter from the Mayors National Climate Action Agenda. Goals of the pledge include: to reduce greenhouse gas emissions, increase investments in renewable energy and energy efficiency, create a clean energy economy, and build relationships to address climate change; and

WHEREAS, the global, national, and local effects of climate change threaten all 10 of the City of Kalamazoo's goals for the future as laid out in the Strategic Vision of the Imagine Kalamazoo 2025 Master Plan; and

WHEREAS, the City has moved forward with initiatives to ensure a sustainable future such as the Complete Streets policy and the Natural Features Protection ordinance, and Imagine Kalamazoo 2025 explicitly recognizes the serious threat of climate change by calling for the development of a City of Kalamazoo Climate Action Plan; and

WHEREAS, upon request from the Director of the Department of Community Planning and Development, a Western Michigan University graduate seminar developed a draft Kalamazoo Climate Action Plan and current efforts by City staff are underway to develop and integrate a Final Climate Action Plan into existing city goals and planning processes; and

WHEREAS, leadership and recognition of the climate crisis from the City of Kalamazoo, as the most populous entity and urban core of the region, promotes both local solutions and regional cooperation; and

WHEREAS, a formal Declaration of a Climate Emergency by the City of Kalamazoo is the critical and courageous first step in laying the foundation to address the climate crisis. A formal declaration will provide the catalyst to mobilize residents, businesses, institutions, faith and community organizations to work together to prioritize the immediate reduction of CO2 emissions and support the City in current efforts to plan for community resilience and adaptation while keeping the concerns of vulnerable populations central to a just transition.

NOW, THEREFORE, BE IT RESOLVED, the City of Kalamazoo declares that a climate emergency threatens our citizens, city, region, state, and the natural world; and

BE IT FURTHER RESOLVED, the intent of this declaration is to both affirm existing commitments and further support City staff in their current efforts to develop a climate action plan that recognizes the climate emergency and set aggressive measurable goals and effective implementation; and

BE IT FURTHER RESOLVED, the City of Kalamazoo accepts a role of regional leadership, and as such will seek partnerships with other regional governments, businesses, community groups, educational and other anchor institutions to best utilize regional expertise and resources to meet shared goals; and

BE IT FURTHER RESOLVED, the City of Kalamazoo will aggressively seek any available state, federal, and private funding for this effort and form alliances with other Michigan cities that have declared a climate emergency or have a written climate action plan to lobby for such funding; and

BE IT FURTHER RESOLVED, the City of Kalamazoo underscores the need for full community participation, inclusion, and support for the climate mobilization effort; and

BE IT FURTHER RESOLVED, the City of Kalamazoo commits to keeping the concerns of vulnerable communities central to a just transition and climate mobilization effort planning processes and to inviting and encouraging such communities to actively participate in order to advocate directly for their needs.

The above resolution was offered by Commissioner Cunningham and supported by Commissioner Cooney.

AYES, Commissioners: Anderson, Cooney, Cunningham, Griffin, Urban, Vice Mayor Knott, Mayor Hopewell

NAYS, Commissioners: None

ABSTAIN, Commissioners: None

RESOLUTION DECLARED ADOPTED.

CERTIFICATE

The foregoing is a true and complete copy of a resolution adopted by the City Commission of the City of Kalamazoo at a regular meeting held on October 21, 2019. Public notice was given and the meeting was conducted in full compliance with the Michigan Open Meetings Act (PA 267, 1976). Minutes of the meeting will be available as required by the Act.



Shelby Moss, Deputy City Clerk

Recycling Challenge Proclamation



State of Michigan, United States of America

Proclamation

Kalamazoo Recycling Challenge

WHEREAS, the Imagine Kalamazoo 2025 Strategic Vision includes environmental responsibility in order to foster the growth of a healthy, green city; and,

WHEREAS, participating Kalamazoo households recycled 2,139 tons of materials in 2018; and,

WHEREAS, the City of Kalamazoo supports EGLE’s goal to improve the quality and quantity of materials that are recycled;

NOW, THEREFORE, ON BEHALF OF THE 52nd CITY COMMISSION, I BOBBY J. HOPEWELL, MAYOR OF THE CITY OF KALAMAZOO do proclaim the City of Kalamazoo joins with the Michigan Department of Environment, Great Lakes, and Energy in the goal of collecting 2,500 tons of household materials annually by 2025.

WHEREAS, the State of Michigan seeks to become the top recycling state in the nation; and,

WHEREAS, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) is launching a statewide education campaign called Know It Before You Throw It to better inform Michiganders on what can – and cannot – be recycled; and,

WHEREAS, the Know It Before You Throw It campaign promotes best practices and emphasizes that recycling saves energy, reduces water use, decreases greenhouse gases, conserves resources and translates into local jobs; and,

WHEREAS, EGLE’s goal is to double Michigan’s recycling rate to 30% by 2025; and,

WHEREAS, the Know It Before You Throw It campaign launched in Kalamazoo on September 16, 2019, and featured EGLE officials, state legislators, and municipal, business, education and environmental leaders; and,

WHEREAS, Kalamazoo has a long history of community involvement and collaboration as a pathway to improving life for all residents; and,

Bobby J. Hopewell,
Mayor



APPENDIX B

Glossary

AC: Alternating Current. Current that frequently changes direction at set intervals.

ACS: American Community Survey

Actions: Used to build up to completion of long-term goals. Usually are short term items that can be completed and are a part of a strategy to attain goals.

ADA: Americans with Disabilities Act

Amenities: Bicycle parking, bus shelters, street lighting, street trees, traffic calming measures, ADA friendly design elements. Essentially any element that provides an essential function to non-motorized and motorized users.

At-Risk Populations: A group of individuals most susceptible to a given event. (Example: Elderly residents and severe high heat and temperatures or children and malnourishment / impoverished conditions).

Blue-Green Trail: Trails adopted by a community to be cared for to preserve / foster recreational usage in a responsible manner.

Biodiesel: Renewable and biodegradable fuel source often made from vegetable or animal oils/fats and recycle restaurant grease.

Biodiversity: Having a variety of species in a local ecosystem helping to keep the system at equilibrium. When biodiversity is reduced it can stress the ecosystem.

BIPOC: Black, Indigenous or People of Color

BRA: Brownfield Redevelopment Authority

BRT: Bus Rapid Transit

CBD: Central Business District (Downtown)

Carbon Emissions: Carbon Dioxide (CO₂) emissions only, sometimes abbreviated as CO_{2e}.

Capital Gain: Profit from the sale of property or from a return on investment.

CE: Consumer's Energy, local Utility company for Kalamazoo, MI.

Census: United States Decennial (10 year) enumeration (count) of persons.

CIP: Capital Improvement Plan. Forecasts future infrastructure projects that need to be planned, funded, and completed on a longer-term basis.

"The City": City of Kalamazoo

Climate Adaptation: Changes to societal, ecological, and economic systems in response to climate change impacts.

Climate Emergency: Recognition that a climate crisis exists and understanding that drastic action is needed to mitigate or halt our impacts on the climate.

Climate Mitigation: Reducing the emissions of harmful greenhouse gases and limiting the effect of global temperature increases.

CMO: City Manager's Office

Code: Often in reference to Building, Electric, or Fire Code which is a standard developers and builders must follow for reasons of safety. Guiding rules in building. May also be in reference to a City Code which is also a set of rules put in place to protect the general welfare and keep the community safe. These are enforceable and backed by law.

Co-Benefits: (Community Benefits) The added benefits we gain when we act to control climate change. Example: Lowering carbon emission improves air quality and decreases health risks to at-risk populations.

Commercial Nodes: Walkable, serving many neighborhoods, near employment and businesses, mixed-use, promotes multi-modal transportation and transit infrastructure.

Community Resilience: The ability for a community to rely on its own networks and resources to limit / negate the effects of external forces (financial, natural).

Community Solar: Projects that accept capital from customers in exchange for tax credits or energy credits.

Community Stewardship: Taking personal responsibility for the well-being of the natural features within a city and acting to protect them.

Complete Streets: Transportation designs and policies that prioritize the safety, accessibility, and usability of all users.

Composting: A process of recovering food and certain paper waste into compost which acts as an important base in gardening.

CPED: Community Planning and Economic Development Department

CSP: Community Sustainability Plan

Dark Sky: Location where the darkness of the sky is relatively unaffected by artificial light sources.

Daylighting: Allowing a stream to be openly flowing through an urban area as opposed to being underground.

DBH: Diameter at breast height when measuring a tree.

DC: Direct Current. Current flowing in only one direction.

Decarbonization: The reduction and eventual elimination of energy consumption using fossil fuels and transition to renewable energies.

Density: Allowing more units to be developed in an area of land.

Density: Commercial and residential development with more units in a smaller area.

Dwelling Unit: Any room or group of rooms located within a structure and forming a single habitable unit with facilities which are used, or are intended to be used, for living, sleeping, cooking, and eating.

Ecosystem Services: Benefits provided to a community by having a healthy ecosystem. Example: Having diverse, healthy, well-maintained trees provides shade, habitat for wildlife, property value increases, privacy, mental health benefits, stormwater retention, erosion prevention, among many others. Often a ripple effect of benefits will occur.

ECC: Environmental Concerns Committee

EGLE: Michigan Department of Environment, Great Lakes, and Energy

EIA: United States Energy Information Administration

Electricity: Unit is measured in kWh or Kilowatt-hours.

Electrification: The conversion of a system to usage of electrical systems only.

Energy Efficiency: Using less energy to achieve the same output.

Energy: kWh(kilowatt hour) for electricity or BTU (British Thermal Unit) for natural gas/heat. Power derived from chemical or physical reactions.

EPA: Environmental Protection Agency

ESP: Expanded Polystyrene Foam, hard to recycle.

EU: Energy Use Intensity

EV: Electric Vehicle

E-W-R: Energy, Wind and Renewables

EWR: Energy Waste Reduction Initiative via the Michigan Public Services Commission.

F: Degrees Fahrenheit, Conversion to Degrees Celsius ($C = (F - 32) * (5/9)$).

FAO: Food and Agricultural Organization of the United Nations

FEMA: Federal Emergency Management Agency

FFE: Foundation for Excellence

Floodplain: An area of low-lying land that is adjacent to a river that is often susceptible to flooding events.

FLU: Future Land Use Map

Food Hub: Serves as the active manager to aggregate, distribute, and market source-identified food products from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand.

FPL: Federal Poverty Level

GHG: Greenhouse Gas Emissions

GIS: Geographic Information Systems

GLISA: Great Lakes Integrated Science + Assessments, affiliated with University of Michigan and NOAA.

Goals: General, long-term challenges that the sustainability plan aims to address.

Green Circular Economy: An economy saves resources, keeps the economy local, and reduces and recovers waste.

Green Jobs: Jobs in industries / businesses / provide services that benefit the environment.

Green Infrastructure: Infrastructure that aids the natural water cycle for capturing and slowing water's movement.

Greenspaces: Areas set-aside for recreational or ecological purposes that generally include significant coverage of trees, grasses, and water.

Grey Infrastructure: Any paved impervious surface (streets, sidewalks, parking lots, buildings).

GSI: Green Stormwater Infrastructure

Heat Island Effect: Urban areas that experience higher temperatures than outlying areas due to excess of impervious grey infrastructure/surfaces which absorb heat.

Historic District: Areas within a city that have valuable, older homes with architectural and historical significance. The City of Kalamazoo has many Historic Districts comprising nearly 10% of total City area.

Household: Includes all persons who occupy a housing unit as their usual place of residence.

Housing Unit: According to the U.S. Census a housing unit or dwelling unit, is a structure or the part of a structure or the space that is used as a home, residence, or sleeping place by one person or more people who maintain a common household and can either be owner-occupied or renter occupied.

HUD: United States Department of Housing and Urban Development

HVAC: Heating, Ventilation, and Air-Conditioning

ICLEI: International Council for Local Environmental Initiatives

Intensity: Where a high number of various uses are near each other without a lot of open, undeveloped land. An example is Downtown Kalamazoo.

IPCC: Intergovernmental Panel on Climate Change

IT: Informational Technology Department

Kalamazooans: Residents of Kalamazoo

Kalamazoo Roots: Container Gardening Program sponsored by the City of Kalamazoo in partnership with Kalamazoo Valley Community College.

KATs: Kalamazoo Area Transportation Study

Kilowatt: 1,000 Watts

KCCC: Kalamazoo Climate Crisis Coalition

KCRC: Kalamazoo County Response Consortium

KNC: Kalamazoo Nature Center

KNHS: Kalamazoo Neighborhood Housing Services

KPI: Key Performance Indicators, similar to measures of success but at a larger scale.

KPL: Kalamazoo Public Library

KVCC: Kalamazoo Valley Community College

LED(s): Light-Emitting Diode

LBNL: Lawrence Berkely National Laboratory

LID: Low-impact development

Light-duty vehicles: Cars and pick-up trucks.

LMI: Low-moderate income

Low Barrier Opportunities: Opportunities with low financial and time costs. Easily completed with current resources and capacity.

Master Plan: A document that acts as a community's guide and helps envision and frame how to achieve community outcomes. For Kalamazoo this is the Imagine Kalamazoo 2025 Master Plan.

MDOT: Michigan Department of Transportation

Measures of Success: Used to help track how actions and strategies are completed during the life of the plan.

Medium-duty and Heavy-duty vehicles: Usually weigh greater than 10,000 pounds and utilize diesel fuel. Examples include school buses, box trucks, tow trucks, etc.

MS: Management Services Department

Micro-mobility: Small vehicles designed for short trips and to be utilized in the public realm (i.e. scooters, bikeshares).

MI-DNR: Michigan Department of Natural Resources

Motorized Travel: Any vehicle utilizing a motor including cars and busses.

MML: Michigan Municipal League

MS4: Municipal Separate Storm Sewer System

MSU-E: Michigan State University Extension

MW: Megawatt (equal to 1,000,000 watts)

Natural Gas: Flammable gas, primarily methane.

Neighborhood Nodes: Similar to the commercial nodes but specific to neighborhoods usually containing a specific character.

Net-Zero Emissions: Reducing or eliminating greenhouse gas emissions to a state where we are not emitting more into the atmosphere than we are eliminating or reducing.

NFP: Natural Features Protection Overlay District

NOAA: National Oceanic and Atmospheric Administration

Non-Motorized Transportation: Walking, biking, running, etc.

Non-Motorized Travel: Bikers, walkers, runners, skates, skateboards, any mode of travel not requiring a motor

NREL: National Renewable Energy Laboratory

Owner-Occupied Housing Unit: The owner lives in the unit.

PACE: Property-Assessed Clean Energy

Parks: Kalamazoo Parks and Recreation

Peer Communities: Communities similar in size, character, population, economy.

Peak Demand Period: Period of the day where there is the most energy usage.

PFC: People's Food Co-op. In Kalamazoo, the organization that runs the Farmer's Market.

Placemaking: Collaborative process that hinges public and private partnerships and grassroots efforts to create accessible public spaces to be used by all.

Power: Measure of work being done. Measured in Watts, Kilowatts (1,000 Watts) or Megawatts (1,000,000 Watts).

PS: Public Services Department

Public Right-of-way: The street, utilities, sidewalk, and curb lawn between private property lines.

Public Transit: Transit allowing for the movement of larger groups of people that is publicly available.

PV: Photovoltaic

Recover: Gathering material that may or may not still be reusable.

Recycle: Scalable gathering of material to extend its life in other products.

Reduce: Limiting the amount of goods and packaging we use.

Renewable Energy: Energy production without the burning of fossil fuels. These include, solar, wind, geothermal, nuclear, hydro energy production.

Renter Occupied Housing Unit: Renter lives in the housing unit.

Retrofits: Installing equipment to an existing structure that increases its energy or heating/cooling efficiency.

Reuse: Repurposing material for other uses.

ROW: Right-of-way

Safe Routes to School: Program overseen by the State of Michigan. Meant to connect school-age children to non-motorized and pedestrian infrastructure, like sidewalks, so they can safely walk or bike to and from school.

Single-Use Items: Generally, items made of plastic that have near zero potential to be recycled and reused again (foams, plastic utensils and plates, cups, food packaging, etc.).

SL: Sustainability Lead (interdepartmental work group and/or new staff capacity)

Smart Growth: Growth plans that allow for more dense urban areas supported and built around public transit within certain limits.

Socio-Economic Characteristics: Measure of social and economic status of an individual, group, or community. Common measures are income, education, and occupation.

SolSmart: National designation program that assists communities with several aspects of solar development from planning and zoning to permitting to local market development.

Southwest Michigan: Allegan, Branch, Clinton, Ingham, Kalamazoo, St. Joseph, Barry, Calhoun, Eaton, Ionia, Kent, Van Buren, Berrien, Cass, Hillsdale, Jackson, and Ottawa Counties. Large Cities include Battle Creek, East Lansing, Grand Rapids, Holland, Jackson, Kalamazoo, Kentwood, Lansing, Portage,

and Wyoming.

SPK: Shared Prosperity Kalamazoo

Strategies: Gameplan to complete goals, usually comprises of specific actions.

Sustainability: The intersection of environmental, social, and financial realms culminating in less waste, lower effects on global climate change, and more equitable resources for everyone.

Tax Rebate: Money returned / refunded to a person when they have paid more taxes than owed.

Tax Credit: Reduce the amount of tax you owe or in some cases become a refund when no tax is owed.

TES: Tree Equity Score, created by American Forests.

Therm: A unit of heat equivalent to 100,000 BTU (British Thermal Units).

TOD: Transit Oriented Development

Transit: The carrying of people, goods, and materials from point A to Point B and anywhere in-between.

Tree Canopy: The crown or tops of trees. Tree canopy coverage is the land shaded by the crown or tops of trees.

UN: United Nations

Virtual Net Metering: Allows multi-tenant building owners to install a single solar system to cover the electricity load of both common and tenant areas connected at the same service delivery point.

VMT: Vehicle Miles Traveled

Waterway: Any navigable body of water.

Water Reclamation: Reusing wastewater and the mechanisms that enable reuse.

Watershed: A group of waterbodies that share the same drainage basin (sort of like a bowl) and are separated from other watersheds by a ridge.

Watt: Standard Unit for Power.

Weatherization: The act of protecting a building and its interior from the elements such as wind, rain, and snow.

Well Protection Area: Areas of groundwater recharge protected from higher density and intense development.

WMU: Western Michigan University





APPENDIX C

References

A Trust for Public Land. (n.d.). *Everyone should have a park within a 10-minute walk of home*. Trust for Public Land. Retrieved March 30, 2022, from <https://www.tpl.org/city/kalamazoo-michigan>

A Trust for Public Land. (2020). *The Heat is On: A Trust for Public Land Special Report 2020* (p. 12). A Trust for Public Land. <https://www.tpl.org/the-heat-is-on>

A Trust for Public Land. (2021). *A Trust for Public Land Park Serve Report: Kalamazoo, MI* (p. 2). A Trust for Public Land. https://www.tpl.org/parkscore?gclid=Cj0KQCQjw5JSLBhCxARIsAHgO2SfBal64b-bantVST1H0xeW9JgMWL9i2kiz70T7ROutBLEtSaWbMlnEEaAgX9EALw_wcB

American Community Survey. (2019a). *2019 American Community Survey 5-year average Home Heating Fuel* [B25040]. U.S. Department of Commerce. <https://data.census.gov/cedsci/table?q=B25040&t=Housing&tid=ACSDT5Y2019.B25040&hidePreview=true>

American Community Survey. (2019b). *2019 American Community Survey 5-year average Total Population by Race* [B02001]. U.S. Department of Commerce. <https://data.census.gov/cedsci/table?g=1600000US2642160&y=2019&d=ACS%205-Year%20Estimates%20Detailed%20Tables&tid=ACSDT5Y2019.B02001>

American Community Survey. (2019c). *2019 American Community Survey 5-year average Year Structure Built* [B25034]. U.S. Department of Commerce. <https://data.census.gov/cedsci/table?q=B25040&t=Housing&d=ACS%205-Year%20Estimates%20Detailed%20Tables&tid=ACSDT5Y2019.B25034&hidePreview=true>

American Community Survey. (2019). *2019 American Community Survey Housing Units by Year* (PL 94-171). U.S. Department of Commerce. <https://data.census.gov/cedsci/table?g=1600000US2642160&y=2020&tid=DECENNIALPL2020.P1&hidePreview=true>

American Council for an Energy-Efficient Economy. (2020). *Energy Burdens in Detroit* (p. 2). American Council for an Energy-Efficient Economy. https://www.aceee.org/sites/default/files/pdfs/aceee-01_ener-

[gy_burden_-_detroit.pdf](#)

American Forests. (2021, June 22). American Forests Launches Nationwide Tree Equity Scores. *American Forests*. <https://af-legacy-prd.americanforests.org/media-release/nationwide-tree-equity-score/>

Atlas Public Policy. (2021, November). Dashboard for Rapid Vehicle Electrification (DRVE). *Atlas Public Policy*. <https://atlaspolicy.com/dashboard-for-rapid-vehicle-electrification-drve/>

Barrett, M. (2018, March 10). *\$2.5M in damage caused by Kalamazoo record-breaking floods*. Mlive. https://www.mlive.com/news/kalamazoo/2018/03/flood_victims_form_coalition_t.html

Billimoria, S., Guccione, L., Henchen, M., & Louis-Prescott, L. (2018). *The Economics of Electrifying Buildings: How Electric Space and Water Heating Supports Decarbonization of Residential Buildings*. (p. 73). Rocky Mountain Institute. <https://rmi.org/insight/the-economics-of-electrifying-buildings/>

Bosse, K. (2021). *Community Gardens on Private Property as a By-Right or Permitted Use – Sustainable Development Code* [Online Book]. Sustainable Development Code. <https://sustainablecitycode.org/brief/community-gardens-on-private-property-as-a-by-right-or-permitted-use-2/>

Bronson Methodist Hospital. (2016). *Community Health Needs Assessment Kalamazoo County* (p. 114). Bronson Methodist Hospital. <https://www.bronsonhealth.com/app/files/public/2302/BMH-Community-Health-Needs-Assessment-Report.pdf>

Brown, A. (2021, July 12). A cool idea for low-income urban areas hard hit by warming climate: More trees. *Washington Post*. https://www.washingtonpost.com/climate-environment/tree-shade-low-income-hot-weather/2021/07/09/508193f4-de8e-11eb-b507-697762d090dd_story.html

Brusseau, M. L., Ramirez-Andreotta, M., Pepper, I. L., & Maximillian, J. (2019). Environmental Impacts on Human Health and Well-Being. In *Environmental and Pollution Science* (pp. 477–499). Elsevier. <https://doi.org/10.1016/B978-0-12-814719-1.00026-4>

Burk, C. (2021, April 27). *Betting on the Farm: Keep Growing Detroit Looks to Purchase Its Eastern Mar-*

ket Plot. Eater Detroit. <https://detroit.eater.com/2021/4/27/22404407/keep-growing-detroit-urban-farm-raises-funds-to-purchase-its-eastern-market-agriculture-plot-gardens>

Chappell, B. (2021, October 1). 5 Midwestern governors agree to create a network to charge electric vehicles. *NPR*. <https://www.npr.org/2021/10/01/1041987104/midwest-electric-vehicles-charging-evs-cars>

Charles, D. (2020, April 3). Food Shortages? Nope, Too Much Food In The Wrong Places. *NPR*. <https://www.npr.org/sections/thesalt/2020/04/03/826006362/food-shortages-nope-too-much-food-in-the-wrong-places>

City of Kalamazoo. (2021a). *Lead Service Line Replacement*. <https://cityofkalamazoo.maps.arcgis.com/apps/dashboards/765de573218b406d8a9062d67286e0e3>

City of Kalamazoo. (2021b). *Single Stream Recycling* [Government]. The City of Kalamazoo Single Stream Recycling. <https://www.kalamazoocity.org/recycling>

City of Madison. (2021). *Bus Rapid Transit (BRT) | Metro Transit, City of Madison, Wisconsin* [Government]. City of Madison Metro Transit. <https://www.cityofmadison.com/metro/routes-schedules/bus-rapid-transit>

Climate.gov Home | NOAA Climate.gov. (2022). <https://www.climate.gov/>

Consumers Energy. (2019). *Consumers Energy Clean Energy Plan Executive Summary 2019* (p. 8). Consumers Energy. <https://www.consumersenergy.com/-/media/CE/Documents/sustainability/integrated-resource-plan-summary.ashx?la=en&hash=9F602E19FE385367FA25C66B6779532142CBD374>

Consumers Energy. (2021). *2021 Clean Energy Plan* (p. 10). Consumers Energy. <https://www.consumersenergy.com/-/media/CE/Documents/company/IRP-2021.ashx?la=en&hash=A345F333F84DE174D-59A6BA8D5A23B2C>

Cusick, D. (2021, June 22). *Trees Are Missing in Low-Income Neighborhoods*. *Scientific American*. <https://www.scientificamerican.com/article/trees-are-missing-in-low-income-neighborhoods/>

Donalds, S. (2020, August 26). Michigan Solar Communities: Using a Community Solar Model to Expand Solar Access to Low- and Moderate-Income Communities. *Clean Energy States Alliance*. <https://www.cesa.org/michigan-solar-communities/>

Drehobl, A., Ross, L., & Ayala, R. (2020). *How High Are Household Energy Burdens? An Assessment of National and M. American Council for an Energy-Efficient Economy*. <https://www.aceee.org/research-report/u2006>

EGLE - Recycling. (n.d.). Retrieved March 30, 2022, from https://www.michigan.gov/egle/0,9429,7-135-70153_69695---,00.html

ElectrifyNY. (2021). *Electric Vehicle Municipal Toolkit – ElectrifyNY*. ELECTRIC VEHICLE MUNICIPAL TOOLKIT. <https://electrifyny.org/ev-municipal-toolkit/>

Elevate Energy. (2017). *Energy Burden in Michigan* (p. 2). Elevate Energy. <https://www.elevatenp.org/wp-content/uploads/Energy-Burden-in-MI.pdf>

Energy Star. (2012). *DataTrends Benchmarking and Energy Savings*. Energy Star. https://www.energystar.gov/sites/default/files/buildings/tools/DataTrends_Savings_20121002.pdf

Environmental Defense Fund. (2019, March 1). *Saving energy with demand response*. Environmental Defense Fund. <https://www.edf.org/energy/saving-energy-demand-response>

FEMA. (n.d.). Retrieved March 30, 2022, from <https://fema.maps.arcgis.com/home/index.html>

Fernandez, M. (2021, September 28). *More than half of U.S. children had detectable lead in blood* [News]. *Axios*. <https://www.axios.com/half-us-children-have-been-exposed-to-lead-d8962771-e289-40e4-a6d5-8e60e4e008f4.html>

Floater, G., Heeckt, C., Ulterino, M., Mackie, L., Rode, P., Bhardwaj, A., Carvalho, M., Gill, D., Bailey, T., & Huxley, R. (2016). *Co-benefits of urban climate action: A framework for cities* (p. 86). London School of Economics and Political Science. <https://www.c40.org/researches/c40-lse-cobenefits>

Frostenson, S., & Kliff, S. (2016, April 6). *Where is the lead exposure risk in your community?* [News]. The Risk of Lead Poisoning Isn't Just in Flint. So We Mapped the Risk in Every Neighborhood in America. <https://www.vox.com/a/lead-exposure-risk-map>

General Motors. (2021, October 27). *Q3 2021 Letter to Shareholders*. Media.Gm.Com. https://media.gm.com/media/us/en/gm/news.detail.html/content/Pages/news/emergency_news/2021/shareholders/q3-21-ceo-letter-to-shareholders.html

Tomer, A., Kane, J., Schuetz, J., George, . (2021, May 12). We can't beat the climate crisis without rethinking land use. *Brookings*. <https://www.brookings.edu/research/we-cant-beat-the-climate-crisis-without-rethinking-land-use/>

Ghamami, M., Zockaie, A., Wang, J., Miller, S., Kavianipour, M., Shojaei, M. (Sam), Fakhrmoosavi, F., Hohnstadt, L., & Singh, H. (2019). Electric Vehicle Charger Placement Optimization in Michigan: Phase I – Highways (Supplement I: Full Tourism Analysis). *Michigan Energy Office by Michigan State University*, 20.

Gill, E. (2018, November 28). *How Knoxville is slashing energy bills for residents* [Online]. <https://bloombergcities.medium.com/how-knoxville-is-making-low-income-housing-more-energy-efficient-de-36ecda4051>

GLISA. (2020). *Great Lakes Regional Climate Change Maps | GLISA* [Research]. GLISA A NOAA RISA Team. <https://glisa.umich.edu/great-lakes-regional-climate-change-maps/>

Gonzalez, J. (2021). *Renewable Energy Policy in Michigan* (MICHIGAN BUSINESS SUSTAINABILITY ROUNDTABLE, p. 7) [Memo]. University of Michigan Erb Center. https://erb.umich.edu/wp-content/uploads/2021/08/ERB-155-MBSR-Policy-Memo_v2.pdf

Griffith, S., Fraser, L., & Calisch, S. (2020). *Rewiring America A Field Manual for the Climate Fight*. Saul Griffith. <https://www.rewiringamerica.org/>

Guenard, M. (2020, December 7). Why we need circular food systems and what cities can do about it. *CityTalk*. <https://talkofthecities.iclei.org/why-we-need-circular-food-systems-and-what-cities-can-do-about-it/>

Hauptman, M., Niles, J. K., Gudin, J., & Kaufman, H. W. (2021). Individual- and Community-Level Factors Associated With Detectable and Elevated Blood Lead Levels in US Children: Results From a National Clinical Laboratory. *JAMA Pediatrics*, 175(12), 1252–1260. <https://doi.org/10.1001/jamapediatrics.2021.3518>

Headwaters Economics. (2012). *Implementing Climate Change Adaptation Lessons Learned from Ten Examples* (p. 49). Headwaters Economics. https://headwaterseconomics.org/wp-content/uploads/Climate_Adaptation_Lessons_Learned.pdf

Headwaters Economics. (2019). *How to Use Economics to Build Support for Climate Adaptation* (p. 22). Headwater Economics. <https://headwaterseconomics.org/wp-content/uploads/2019HE-Economics-for-Climate-Adaptation-Full-Report-2019.pdf>

Headwaters Economics. (2021a). *Neighborhoods At-Risk Tool* [Web-based App]. Headwaters Economics. <https://headwaterseconomics.org/apps/neighborhoods-at-risk/>

Headwaters Economics. (2021b). *Populations At Risk for Kalamazoo, MI* (p. 31). Headwaters Economics.

Higgins, T., Matusiak, A., Majumder, B., Calisch, S., & Lai, D. (2021, June 3). *To Decarbonize Households, America Needs Incentives for Electric Appliances—Center for American Progress* [Research].

Center for American Progress. <https://www.americanprogress.org/issues/green/reports/2021/06/03/500084/decarbonize-households-america-needs-incentives-electric-appliances/>

Huether, P. (2021, April 7). *Siting Electric Vehicle Supply Equipment (EVSE) With Equity In Mind*. Siting Electric Vehicle Supply Equipment (EVSE) With Equity In Mind. <https://www.aceee.org/white-paper/2021/04/siting-electric-vehicle-supply-equipment-evse-equity-mind>

Intergovernmental Panel on Climate Change (IPCC). (2021). *IPCC Regional Factsheet—Urban Areas* [PowerPoint PDF]. https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_Urban_areas.pdf

Kalamazoo Area Transportation Study. (n.d.). Kalamazoo Area Transportation Study. Retrieved March 30, 2022, from <https://katsmpo.org/>

Khamis, H. (2019). *FAO framework for the Urban Food Agenda [IN BRIEF]*. 8.

Kraak, M., RE, R., Rickner, B., Kagawa, A., & Le Sound, G. (2020). *Mapping for a Sustainable World*. The United Nations and International Cartographic Association. <https://digitallibrary.un.org/record/3898826?ln=en>

Lazard. (2019). *Lazard's Levelized Cost of Energy Analysis—Version 13.0* (p. 20). <https://www.lazard.com/media/451086/lazards-levelized-cost-of-energy-version-130-vf.pdf>

Levin, S., Barrett, M., & Gibbons, L. (2021, August 13). *Michigan is more diverse, west side sees population surge and more takeaways from 2020 Census data—MLive.com* [News]. MLive. <https://www.mlive.com/public-interest/2021/08/michigan-is-more-diverse-west-side-sees-population-surge-and-more-takeaways-from-2020-census-data.html>

Lin, W., Brunekreef, B., & Gehring, U. (2013a). Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children. *International Journal of Epidemiology*, 42(6), 1724–1737. <https://doi.org/10.1093/ije/dyt150>

Michigan Green Communities Program. (n.d.). Michigan Green Communities. Retrieved March 30, 2022, from <https://migreencommunities.com/>

Michigan Public Service Commission. (2021a). *MPSC - Energy Waste Reduction* [Government]. Energy Waste Reduction. https://www.michigan.gov/mpsc/0,9535,7-395-93308_94792---,00.html

Michigan Public Service Commission. (2021b). *MPSC - Energy Waste Reduction*. MPSC - Energy Waste

Reduction. https://www.michigan.gov/mpsc/0,9535,7-395-93308_94792---,00.html

Michigan State University. (2020, 2021). *Michigan Local and Regional Food System Workforce Assessment* [Research]. Michigan Local and Regional Food System Workforce Assessment. <https://www.canr.msu.edu/michigan-food-workforce/index>

Minneapolis Metro Transit. (2021). *Transit Oriented Development* [Government]. Metro Transit Transit Oriented Development. <https://www.metrotransit.org/tod>

Misbrenner, K. (2021, July 26). *Michigan Municipal League backs state community solar legislation*. Solar Power World. <https://www.solarpowerworldonline.com/2021/07/michigan-municipal-league-backs-state-community-solar-legislation/>

Municipal Research and Service Center. (2021). *MRSC - Transit-Oriented Development* [Research]. MRSC Empowering Local Governments. <https://mrsc.org/Home/Explore-Topics/Planning/Development-Types-and-Land-Uses/Transit-Oriented-Development.aspx>

Nadel, S. (2017, February 9). Demand response programs can reduce utilities' peak demand an average. *Demand Response Programs Can Reduce Utilities' Peak Demand an Average*. <https://www.aceee.org/blog/2017/02/demand-response-programs-can-reduce>

Nandi, Dr. P. (2021, September 29). *Over half of children have detectable levels of lead in blood, study says* [News]. Over Half of Children Have Detectable Levels of Lead in Blood, Study Says. <https://www.wxyz.com/news/study-over-half-of-children-in-the-u-s-have-detectable-levels-of-lead-in-their-blood>

NIST. (2016, November 16). *Community Resilience* [Text]. NIST. <https://www.nist.gov/community-resilience>

NREL. (2021). *National Renewable Energy Laboratory*. Personally Owned Light Duty Vehicle Miles Traveled. <https://maps.nrel.gov/slope>

Office of Disease Prevention and Health Promotion. (2020). *Environmental Health*. Environmental Health

- Healthy People 2030. <https://health.gov/healthypeople/objectives-and-data/browse-objectives/environmental-health#cit2>

Office of Electricity. (2021). *Demand Response*. Energy.Gov. <https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid/demand-response>

Pearce, J. M., & Sommerfeldt, N. (2021). Economics of Grid-Tied Solar Photovoltaic Systems Coupled to Heat Pumps: The Case of Northern Climates of the U.S. and Canada. *Energies*, 14(4). <https://doi.org/10.3390/en14040834>

PFC Markets. (2021). *PFC Locally Grown Community Owned*. PFC Markets. <http://pfcmarkets.com/>

PFC Natural Grocery & Deli. (n.d.). PFC Natural Grocery & Deli. Retrieved March 30, 2022, from <https://www.pfckalamazoo.coop>

PlugShare. (2021). *Kalamazoo-Portage, Michigan EV Charging Stations | PlugShare*. <https://www.plugshare.com/directory/us/michigan/kalamazoo-portage>

Rasp, E., Lee, C., & DesRosches, C. (2019). *2019 Minneapolis Mobility Hubs Pilot Report* (p. 52). The Musicant Group for the City of Minneapolis. <https://www2.minneapolismn.gov/media/content-assets/www2-documents/departments/wcmssp-224822.pdf>

Rasp, E., Musicant, M., Quarles, V., & Lee, C. (2020). *2020 Minneapolis Mobility Hubs Pilot Report* (p. 48). The Musicant Group for the City of Minneapolis. <https://www2.minneapolismn.gov/media/content-assets/www2-documents/departments/Mobility-Hub-Pilot-2020.pdf>

Recycling. (n.d.). Retrieved March 30, 2022, from <https://www.kalamazoocity.org/recycling>

Riggs, T., Schantz, M., Mulligan, J. A., Rose, D. J., & Weil, B. (2021). *ULI Sustainability Outlook 2021*. Urban Land Institute. <https://americas.uli.org/research/centers-initiatives/greenprint-center/greenprint-resources-2/best-practices-in-sustainable-real-estate/uli-sustainability-outlook-2021/>

Regional Transit Authority of Southeast Michigan. (2021). *RTA* [Government]. Regional Transit Authority of Southeast Michigan.

<https://rtamichigan.org/>

Secon, H. (2020, September 8). *3 ways to accelerate a circular food system, even in the middle of a pandemic* | *Greenbiz*. <https://www.greenbiz.com/article/3-ways-accelerate-circular-food-system-even-middle-pandemic>

Shaughnessy, E., Barbose, G., Wiser, R., Forrester, S., & Darghouth, N. (2020). The impact of policies and business models on income equity in rooftop solar adoption. *Nature Energy*. <https://doi.org/10.1038/s41560-020-00724-2>

Smart Growth America. (2019). *Benefits of Complete Streets Toolkit User Guide* (p. 25). Prepared by the Centers for Disease Control and Prevention for Smart Growth America. <https://benefits.completestreets.org/about/>

Snapshot. (n.d.-a). Retrieved December 22, 2021, from <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

Snapshot. (n.d.-b). Retrieved October 18, 2021, from <https://www.epa.gov/transportation-air-pollution-and-climate-change/carbon-pollution-transportation>

Solar Energy Technologies Office. (2020). *Solar Futures Study* [Research]. Solar Futures Study, Solar Energy Technologies Office. <https://www.energy.gov/eere/solar/solar-futures-study>

State of Michigan. (2021). *Regional Electric Vehicle Midwest Coalition Memorandum of Understanding Between Illinois, Indiana, Michigan, Minnesota, and Wisconsin*. State of Michigan. https://www.michigan.gov/documents/leo/REV_Midwest_MOU_master_737026_7.pdf

Streetmix. (2021). *Streetmix* [Educational]. Streetmix. <https://streetmix.net/>

The Paris Agreement | UNFCCC. (2022). <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

The Rapid. (2021). *Silver Line* [Government]. The Rapid. <https://www.ridetherapid.org/howtoride/silver-line>

Tubiello, F. N., Rosenzweig, C., Conchedda, G., Karl, K., Gütschow, J., Xueyao, P., Obli-Laryea, G., Wanner, N., Qiu, S. Y., Barros, J. D., Flammini, A., Mencos-Contreras, E., Souza, L., Quadrelli, R., Heiðarsdóttir, H. H., Benoit, P., Hayek, M., & Sandalow, D. (2021). *Greenhouse gas emissions from food systems: Building the evidence base*. 16(6), 14. <https://doi.org/10.1088/1748-9326/ac018e>

Transforming our world: The 2030 Agenda for Sustainable Development, A/RES/70/1, United Nations General Assembly, 70/1 43 (2015). <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>

Urban Bird Treaty | *What We Do* | U.S. Fish & Wildlife Service. (n.d.). Retrieved March 30, 2022, from <https://www.fws.gov/program/urban-bird-treaty/what-we-do>

U.S. Census Bureau. (2020). *2020 U.S. Census, Total Population by Race* (PL 94-171). U.S. Department of Commerce. <https://data.census.gov/cedsci/table?g=1600000US2642160&y=2020&tid=DECENNI-ALPL2020.P1&hidePreview=true>

US Department of Commerce, N. (2021). *Climate*. NOAA's National Weather Service. <https://www.weather.gov/wrh/Climate?wfo=grr>

U.S. Department of Energy. (2014). *Energy 101: Everything you need to know about Home Heating*. U.S. Department of Energy. <https://www.energy.gov/sites/default/files/2014/01/f6/homeHeating.pdf>

U.S. Department of Energy. (2020). *SolSmart* | *Nationally Distinguished. Locally Powered*. SolSmart. <https://solmart.org/>

U.S. Department of Transportation. (2010). *Public Transportation's Role in Responding to Climate*

Change (p. 20). Federal Transit Administration. <https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/PublicTransportationsRoleInRespondingToClimateChange2010.pdf>

U.S. Energy Information Administration. (2021, June 23). *Use of energy in homes—U.S. Energy Information Administration (EIA)* [Research]. Use of Energy Explained. <https://www.eia.gov/energyexplained/use-of-energy/homes.php>

U.S. Environmental Protection Agency. (2015a, August 25). *Fast Facts on Transportation Greenhouse Gas Emissions* [Overviews and Factsheets]. <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

U.S. Environmental Protection Agency. (2015b, September 10). *Carbon Pollution from Transportation* [Overviews and Factsheets]. <https://www.epa.gov/transportation-air-pollution-and-climate-change/carbon-pollution-transportation>

U.S. Environmental Protection Agency. (2020). *2020 U.S. GHG Emissions by Sector* [Fast Facts on Transportation Greenhouse Gas Emissions]. <https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions>

U.S. Forest Service. (2016, February 1). *Loss of Open Space*. US Forest Service. <http://www.fs.usda.gov/science-technology/loss-of-open-space>

U.S. Forest Service. (2021). *Urban Natural Resources Stewardship*. URBAN TREE CANOPY ASSESSMENT: A Community's Path to Understanding and Managing the Urban Forest. <https://www.nrs.fs.fed.us/urban/utc/>

USDA. (2013). *Cooperatives and Food Hubs* | *Alternative Farming Systems Information Center* | NAL | USDA. <https://www.nal.usda.gov/afsic/cooperatives-and-food-hubs>

USDA Farm Service Agency. (2018). *NAIP Imagery* [Page]. National-Content. <https://fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/index>

ValleyHUB at the Food Innovation Center—Kalamazoo Valley Community College. (n.d.). Retrieved March 30, 2022, from <https://www.kvcc.edu/valleyhub/>

Wayland, M. (2021, January 28). *General Motors plans to exclusively offer electric vehicles by 2035.* CNBC. <https://www.cnbc.com/2021/01/28/general-motors-plans-to-exclusively-offer-electric-vehicles-by-2035.html>

Zero Cities Project. (2018). *Zero Cities Project Equity Assessment Tool* (p. 29). Prepared by Race Forward for the Zero Cities Project. https://www.usdn.org/uploads/cms/documents/equity_assessment_tool_-zero_cities_project_-_race_forward_2019.pdf

Ziter, C. D., Pedersen, Eric. J., Kucharik, C. J., & Turner, M. G. (2019). Trees are crucial to the future of our cities. *ScienceDaily*. <https://doi.org/10.1073/pnas.1817561116>