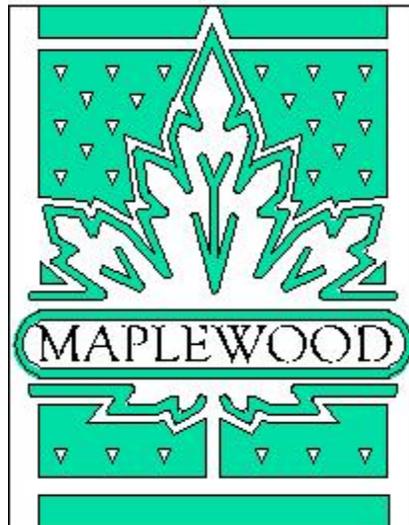


**City of Maplewood
7601 Manchester Road
Maplewood, Missouri 63143**



**Community and Local Government Operations
Climate Action Plan
2013**

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Respectfully Submitted,



Amanda M. La Brier

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EXECUTIVE SUMMARY

This Climate Action Plan provides recommendations for the City of Maplewood, Missouri community-wide and local government operations to reduce emissions outlined in the greenhouse gas inventory conducted in 2012 and completed in January 2013. As a result of the consumption defined in the inventory report for baseline year 2010, each sector must find alternatives to reduce both energy use and greenhouse gas emissions; this report highlights possible alternatives to meet municipal goals. Adoption and implementation of this plan will aid municipal officials in their effort to meet outlined target reductions defined in the GHG emissions inventory report.

This plan includes excerpts from the completed Greenhouse Gas (GHG) emissions inventory conducted beginning in September of 2012 and completed in January of 2013. Inventoried emissions released throughout 2010 are reported as the baseline year. Inventoried emissions released throughout 2011 and 2012 are reported as interim years and are analyzed comparatively. The three years inventoried were separated into two parts as designated by ICLEI protocols: City of Maplewood Local Government Operations (LGO) and the Community-Wide sectors defined within the boundaries of the City of Maplewood. They are reported separately in order to apply best practices and future policy development and implementation for GHG emissions and energy use reduction in municipal operations and the community at large.

This plan does not include comprehensive financial audits and requirements to reduce GHG and meet target reductions of community-wide or local government operations energy usage, fuel consumption, solid waste production or other activities that create emissions and have a fiscal impact. Additional in-depth research, analysis and audits may be required for fiscal impact of energy use and emissions in a municipal community and local government operations, and would be separate from the recommendations in this plan.

This plan outlines the necessity of formal stakeholder participation to provide the community and local government with the information and oversight necessary to achieve energy consumption and GHG target reduction goals. Formal participation by Maplewood stakeholders, including citizens, business owners, non-profits, governments and local government employees is essential for Maplewood to move toward a more sustainable community, and the recommendations to follow highlight the steps to achieve the target reduction goal of 10% by 2020.

RECOMMENDATIONS

COMMUNITY-WIDE

1. Establish a *Community-Wide Energy and Emissions Reduction Task Force* to assist the Sustainability Commission with the following recommendations:
 - 1.1. Educational Programs informing stakeholders about Natural Gas & Purchased Electricity energy efficiency opportunities.
 - 1.1.1. Temperature regulation in homes and businesses.
 - 1.1.1.1. Digital Thermostat Drive for low to medium income Maplewood residents.
 - 1.1.2. Light & Equipment Regulation.
 - 1.1.3. Energy weatherization programs.
 - 1.1.4. Composting opportunities.
 - 1.1.5. Storm water treatment opportunities.
 - 1.1.5.1. Maplewood “Tree City USA” and Native Plants
2. Establish a *Community-Wide Transportation Emissions Reduction Task Force* to assist the Sustainability Commission with the following recommendations:
 - 2.1. Educational Programs to inform stakeholders
 - 2.1.1. Encourage and promote a more expansive use of public transit System.
 - 2.1.1.1. Business and industry stakeholders offer employees working in Maplewood a reduced cost Metrolink pass.
 - 2.2. Cost Benefit Analysis
 - 2.2.1. Metrolink pass for a reduced fee with Maplewood occupancy permitting.
 - 2.2.2. Circular intersection infrastructure at Manchester & Hanley Road and Manchester & Big Bend Boulevard.
 - 2.2.3. Installation of bicycle racks along Maplewood retail corridor at Manchester Road & Sutton Avenue.

LOCAL GOVERNMENT OPERATIONS

3. Establish a *LGO Energy & Emissions Reduction Green Team Task Force* to assist the Sustainability Commission with the following recommendations:

- 3.1. Cost Benefit Analysis

- 3.1.1. City Hall Renovation.

- 3.1.1.1. Roof Replacement – White/Cool Roof versus Living Roof Options.

- 3.1.1.2. Insulation installation to increase R-Value.

- 3.1.2. Aquatic Center – Solar Panel Installation.

- 3.1.3. Energy Services Provider Company to conduct in-depth energy audit of LGO.

- 3.1.4. Police Department motorcycle patrol.

- 3.1.5. Solar powered electric car charging stations at the Marietta parking lot.

- 3.2. Administrative Policies

- 3.2.1. 2009 International Energy Conservation Code Adoption for residential and commercial properties.

- 3.2.2. Mandate office equipment energy conservation.

- 3.2.3. Flexible work schedules – Four ten-hour days.

- 3.2.4. Public Works employees Garage Cleanup Day once a quarter.

- 3.2.5. Replace current lighting with energy efficient light bulbs and fixtures where applicable.

- 3.2.6. Continue rotation replacement of fuel efficient model vehicles in municipal fleet.

- 3.2.7. Review zoning ordinance requirements to assure open space and green space preservation.

- 3.2.8. Require LEED Green Building Rating System of Silver Level or higher for New Construction and Renovations exceeding 10,000 square feet or \$1M and greater.

LOOKING FORWARD

All municipalities, counties, regions, nations, countries, citizens, and businesses are vulnerable to climate change and its impacts. Passive approaches to emissions reduction only prolong the inevitable. Change, no matter how difficult, is unavoidable. Action to positively change the value placed on our environment and natural resources develops practices that bring all stakeholders closer to long-term sustainability. Stakeholder's hopes, dreams, ideas, and goals are essential, but for sustainability to reign, each person must individually move forward with progress in mind. The effect of individual action will be collectively beneficial.

Individual effort is critical to advancement, and individuals who effectively engage stakeholders to work in concert generate progress. Collaboration breeds success and is contagious. Looking forward from here, the City of Maplewood must proactively collaborate with a variety of entities and individuals to positively reinforce environmental value and create community-wide activities and programs along with local government policies and procedures that focus on energy use and greenhouse gas emissions reductions. Students, citizens, businesses, non-profits, faith-based organizations, and municipal and state governments working together toward the same goal will instill the knowledge required for progress.

Economic constraint limits the time in which goals can be achieved, but it does not eliminate the opportunity to accomplish goals and advance communities, from the local municipality to global society. Maplewood has the opportunity to continue the energy use and greenhouse gas emissions reduction reflected in the 2013 GHG inventory report, by first adopting this plan and formulating the outlined stakeholder task forces to assist the Maplewood Sustainability Commission with the specific recommendations in this plan. Maplewood will optimize collaboration and likely achieve the target reduction goal of 10% by 2020 through recruiting task force members from business service providers, government entities and non-profit organizations that are vested in energy consumption and greenhouse gas emission initiatives.

Oversight of task force initiatives, as well as monitoring and tracking of future energy consumption and GHG emissions should be governed by the Sustainability Commission. The Commission must continue to work with Maplewood officials to ensure that the recommendations in this plan are considered and implemented where applicable. The Commission can assist local government officials with task force recruitment, fundraising and grant opportunities, community activities, educational program development and public relations initiatives that continue to move Maplewood toward a more sustainable community.

In general, going forward, The Maplewood Sustainability Commission, future task forces, and local government officials and staff will need to continue to educate Maplewood stakeholders about the anthropogenic [human caused] effect of natural resource use. Understanding the key component, the value of natural resources – energy, air quality, health and human capital; and knowing the effect individual and collective actions cause is progress. Further education and understanding that the goals of this plan are achievable and work to prevent natural resource loss, that cannot be regenerated, is critical to move toward a more sustainable community. The City of Maplewood will positively progress with citizen and government collaboration.

INTRODUCTION

CLIMATE CHANGE: GLOBAL, NATIONAL, LOCAL

Despite controversy and debate among the international community over GHG emission measurements and impacts, the consensus remains that our climate is changing across the globe. The United Nations Kyoto Protocol basis for climate change assessment established a framework by which countries evaluate GHG emissions and the Global Warming Potential (GWP).¹ This foundation supplies mechanisms and standards for understanding climate change assessments. The Global Climate Change Act of 1990 requires that the United States of America conduct a national climate assessment every four years to report climate change data and trending.² The intergovernmental body tasked with this reporting is scheduled to release its latest report in 2013. ICLEI – Local Governments for Sustainability provide the structure to assess municipal community and government operations GHG emissions and energy use based on global climate change mechanisms and standards, and are conducted at will.³ These organizations and acts are recognized as the foundations by which GHG emissions are determined and analyzed over a specified period of time in order to better understand the impacts of climate change as it is attributable to anthropogenic [*human caused*] activities globally, nationally and locally.

Greenhouse gas assessments coupled with a better understanding of climate change impacts at a local level establish the starting point to begin recommending changes in local government operations and community-wide activities in a climate action plan. Formal strategies to reduce energy use and emissions in a climate action plan move municipalities toward a healthier more sustainable environment for residents, business, and employees in the community. The sections of this Climate Action Plan reiterate the findings and reinforce the processes as described in the 2013 GHG Inventory report, and recommend strategies to assist the City of Maplewood with energy consumption and greenhouse gas emissions reduction by 2020.

¹ For more information about the Kyoto Protocol visit http://www.unfccc.int/kyoto_protocol/items/2830.php.

² For more information on U.S. Climate Change reporting, the most recent report, or the Act of 1990 visit www.globalchange.gov.

³ For more information about ICLEI Local Government for Sustainability visit <http://www.iclei.usa.org/>.

LOCAL GOVERNMENT SUSTAINABILITY IN METROPOLITAN ST. LOUIS

Metropolitan St. Louis is full of vibrant non-profit organizations whose missions are dedicated to advancing the urban community and mid-west region. Focus St. Louis is one of many area non-profits who “focus” on community development. Specifically, Focus St. Louis works to promote outstanding leaders in the St. Louis metropolitan region in many fields, including sustainability. They are a local public partner

engaged in sustainable community development. Table 3: Focus St. Louis Sustainability Roadmap above shows the five key steps to environmental sustainability that help regional, government business, and industry navigate toward sustainability.⁴

Focus St. Louis Key Steps to Environmental Sustainability	
1.	Commit to Action
2.	Assess the Situation
3.	Make Plans
4.	Implement
5.	Measure to Celebrate Success

Table 1: Focus St. Louis Sustainability Roadmap



Figure 1: USGBC Missouri Gateway Chapter

Like Focus St. Louis, The U.S. Green Building Council (USGBC) Missouri Gateway⁵ Chapter is also dedicated to environmental sustainability. The USGBC works in collaboration with area stakeholders in local business and industry, as well as municipal, county and state government, to educate individuals about sustainable development, energy efficiency and emissions reduction. In 2012, The Gateway Chapter of the USGBC partnered with The City of Maplewood to conduct a Greenhouse Gas Inventory and develop a Climate Action Plan in 2013 to aid the municipality in its efforts to move toward a sustainable community. Maplewood and the USGBC worked in concert through the USGBC Regional Environmental Internship Program to complete the inventory and develop the strategic plan for the municipality.

⁴ Focus St. Louis, Environmental Sustainability Roadmap: A Toolkit for Local Governments (St. Louis, MO Focus, 2009) <http://focus-stl.org/>.

⁵ USGBC Missouri Gateway Chapter (St. Louis, MO: USGBC St. Louis, 2012) <http://www.usgbc-mogateway.org/>

2013 GHG INVENTORY MAJOR FINDINGS

Over the course of the research study of Community-Wide and Local Government Operations energy use and GHG emissions inventory, a variety of interesting findings were uncovered. The City of Maplewood's participation in this research and analysis of calendar year 2010, 2011 and 2012 resulted in an outcome indicating overall CO₂e⁶ emissions for the Community-Wide and Local Government Operations combined totaled 105,045 metric tonnes in baseline year 2010. Just two years later the combined emissions in 2012 totaled 99,373 CO₂e. Over the past three years the City of Maplewood has reduced its overall CO₂e emissions by 5%. The following tables highlight some of the major findings and positive impacts discovered in the research and analysis.

Table 2: City of Maplewood Emissions Per Household summarizes the total CO₂e metric tonnes in baseline year 2010 emitted from households in the City of Maplewood. As the table outlines, the 4,500 plus households located in the City of Maplewood emit 23 mt of CO₂e on average each year.

Community-Wide Annual Household Emissions	
mt CO₂e Emissions Per Household	23

Source: City of Maplewood, 2013 & U.S. Census 2010

Table 2: City of Maplewood Emissions Per Household

Table 3: City of Maplewood Emissions Per Capita provides the average mt of CO₂e emitted per person in the City of Maplewood in baseline year 2010. Considering Maplewood's U.S. census population in 2010 of 8,044 and natural gas, purchased electricity, transportation, solid waste and wastewater treatment sources the average annual emissions per person is 13 mt of CO₂e.

Community-Wide Emissions Per Capita	
mt CO₂e Emissions Per Capita	13

Source: City of Maplewood, 2013 & U.S. Census 2010

Table 3: City of Maplewood Emissions Per Capita

⁶ Carbon Dioxide equivalent (CO₂e) is the ratio greenhouse gases to Carbon Dioxide. CO₂e calculation is explained in detail in The City of Maplewood 2013 Greenhouse Gas Inventory Report.

Generally, Table 1: City of Maplewood, Missouri GHG Inventory Major Findings highlights the three major emissions sources trending in the Community-Wide and Local Government Operations study over the three year period from 2010 to 2012. Each of the highlights below is detailed in the full report. The City of Maplewood's current downward emissions trend illustrates the municipality's movement toward sustainability.

City of Maplewood, Missouri GHG Inventory Major Findings		
Emissions Activity	Community-Wide	Local Government Operations
Purchased Electricity	Leading Sector Emissions	3 Year downward trend
Natural Gas	3 Year downward trend	3 Year downward trend
Transportation & Vehicle Fleet	Light-Truck and Passenger Car Make up 78% of Emissions	Using Less Fuel and Creating Less Emissions from 2011 to 2012

Source: City of Maplewood, 2013

Table 4: City of Maplewood, Missouri GHG Inventory Major Findings

Overall, the City of Maplewood community-wide and local government operations have progressively moved toward becoming more sustainable. The known and unknown effort from residents, business, industries and government has positively impacted the municipality over the past three years. In total sum, the past, present and planned future actions, reflects that Maplewood stakeholders continue to move toward a healthy, prosperous and friendly community.

REDUCTION TARGET

At the current rate of usage and consumption without any added target reduction goals or climate action planning by the year 2020 emissions in both Community-Wide and LGO will be on the rise to original baseline year 2010 levels only factoring future transportation fuel efficiency standards. Figure 35: LGO Emissions Forecast for 2020 and Figure 36: Community-Wide Emissions Forecast for 2020 illustrates the expected emissions rise in year 2020. As the figures outline LGO emissions will likely return to 1,189 mt CO₂e and Community-Wide emissions will likely see a rise to 99,603 mt CO₂e. As both graphs demonstrate current usage and emissions with no added effort will move the City of Maplewood in a different direction than the community is currently headed.

This business as usual approach illustrates the rise in emissions with all anthropogenic activities in Maplewood remaining the same as reflected in the 2013 GHG Inventory. Forecasting the above increase in emissions from baseline year 2010 does not consider other contributing emissions factors that may also cause a rise in CO₂e such as population growth rate, job growth rate, inclement weather patterns, or technological advancements that may reverse emissions rise.

As of December 2012 the City of Maplewood Community-Wide emissions have reduced from 103,855 mt CO₂e in 2010 to 98,328 mt CO₂e in 2012. The difference of 5,527 mt CO₂e translates to a Community-Wide reduction of 5% over the three year period. Likewise, Maplewood LGO has also reduced CO₂e from 1,190 mt CO₂e in 2010 to 1,045 mt CO₂e in 2012. This translates to a 12% reduction for the LGO. Combined, the Maplewood Community has reduced its emissions from 2010 through 2012 by 5%.

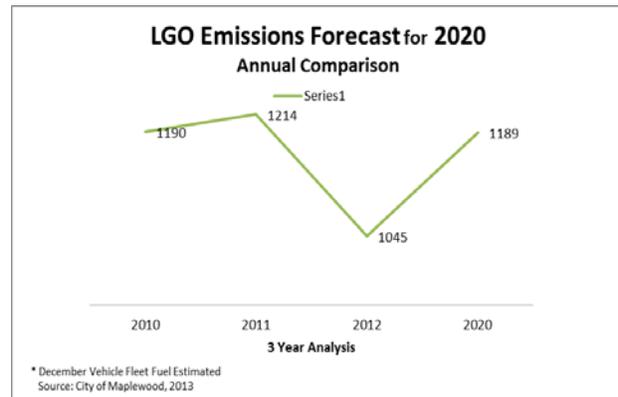


Figure 2: LGO Emissions Forecast for 2020

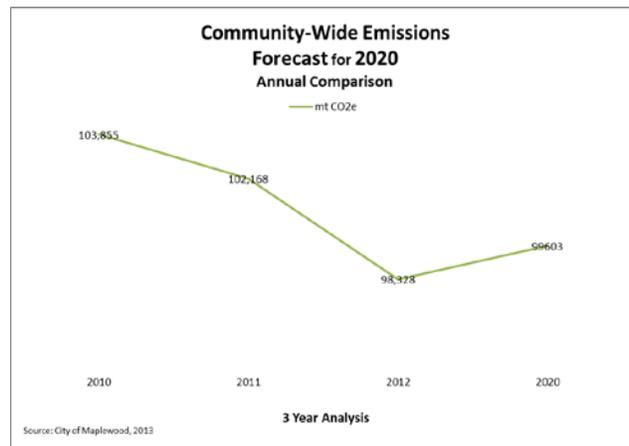


Figure 3: Community-Wide Emissions Forecast for 2020

Moving forward from baseline year 2010, the City of Maplewood has set the GHG CO₂e emissions target reduction percentage of 10% to be met by 2020. Given the current downward trend, the original U.S. Mayor's Climate Protection Agreement pledge of 7% GHG emissions reduction is achievable by 2015. Notwithstanding ongoing efforts by the community and the local government, it is recommended that a 10% decade reduction from baseline year 2010 is both an admirable and achievable goal that is 3% beyond the initial pledge. With that in mind, Maplewood's continued efforts toward sustainability should work to reach a 10% GHG emissions reduction by 2020.

UNDERSTANDING A CLIMATE ACTION PLAN

ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY

The City of Maplewood’s affiliation with ICLEI – Local Governments for Sustainability laid the foundation for the municipality to share administrative and technical information to conduct a GHG Inventory in 2013. In addition, Maplewood’s association with ICLEI provides innovative knowledge that guides communities and local governments in developing a Climate Action Plan. The development of a Climate Action Plan is the third milestone of ICLEI local Governments for Sustainability five milestone processes. The Plan establishes long-term strategic community-wide and local government operations to reduce greenhouse gases and energy use through stakeholder participation. Stakeholders, including citizens, business owners, non-profits, governments and local government employees, participate in the planning process by recommending ideas to reduce energy and greenhouse gas emissions. This effort aids the municipality in outlining goals in the plan to meet the target emissions reduction set in the GHG Inventory.

ICLEI PROCESS

ICLEI outlines the process for GHG emission and energy use inventory and reduction as well as climate action planning into five milestones. Figure 2 illustrates the milestones and process flow for municipalities to follow. This report encompasses *Milestone 3, Developing a Climate Action Plan; Milestones 4, Implement Climate Action Plan; and Milestone 5, Monitor/Evaluate Progress* outlined by ICLEI. With the adoption of an established target reduction in *Milestone 2*, and the completion of this climate action plan, Maplewood is proceeding with the commitment to reduce energy use and GHG emissions.



Figure 4: ICLEI Process

ICLEI PROTOCOLS

Milestone 1 of ICLEI's five milestone process for GHG emissions inventory provides a guideline and instruction for the municipality in collecting, analyzing and presenting community-wide and local government operations GHG emissions and energy use inventory in two protocols based on municipal boundaries as outlined in Figure 3.

As illustrated in the figure below, energy use and GHG emissions are divided and measured in two specific boundaries. **Community-Wide** energy use and GHG emissions make up the largest portion of the inventory, and are pre-determined by the municipality's geographic boundaries. In other words, all of the energy used, combined with all of the activities that create GHG emissions within the city limits of Maplewood determine the bounded area considered and calculated in this plan.

The energy use and GHG emissions inventory also includes the **Local Government Operations (LGO)**, which incorporates all energy used combined with activities that create GHG emissions that are under the municipal governments "operational control." The LGO energy usage and GHG emissions are inventoried separately from the community

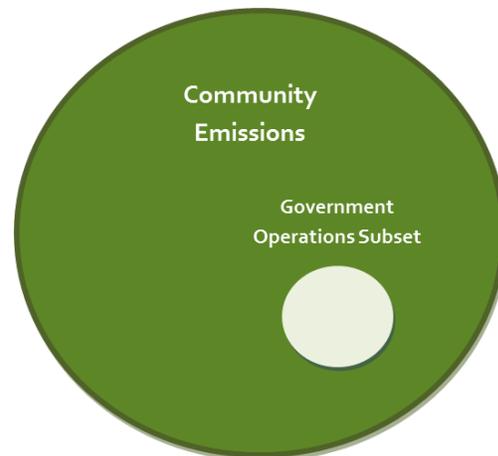


Figure 5: ICLEI Protocol Boundaries

in order to better identify and quantify emissions generated from municipal service provisions compared to overall community usage. This allows the LGO to efficiently allocate resources and develop best practices within municipal operations for the community at large.

BENEFITS OF A CLIMATE ACTION PLAN

A Climate Action Plan is the next step following a GHG emissions inventory. The inventory provides the GHG baseline to compare future performance and demonstrate progress in emissions reduction within a municipality. The GHG baseline helps stakeholders establish a foundation, and outline realistic and achievable goals in climate action plans and comprehensive municipal strategic plans. Inventory baselines also aid municipal officials and citizenry with knowledge to identify budget and fiscal constraints within the community.

Emissions reduction targets, recommendations and goals in a climate action plan help to organize the identified constraints.

Moreover, the disclosure of baseline levels of the GHG emissions activities and sources in the Community-Wide and LGO add transparency in local municipalities. Transparency in energy usage, fuel consumption and emissions translates to transparency in spending. Clear allocation of municipal resources improves the environment for all stakeholders in the community and is an asset in climate action planning.

The development of a Climate Action Plan establishes collaborative partnerships with the municipality and its stakeholders. Business, industry, citizens, and local government employees participation in climate action planning is an investment in long-term community development and establishes relationships that promote sustainability in the place where they live, work, and play. These partnerships and relationships foster consideration and commitment in the municipality at large, instilling progress community wide.

Education is provided to community stakeholders in greenhouse gas inventory reporting and in climate action planning. Having an informed constituency adds to the knowledge base of a municipal electorate and adds to the transparency of local government operations and resource allocation.

Lastly, climate action planning benefits communities by setting realistic goals that are achievable in a specified period of time. Recommendations and defined goals to reduce energy and GHG emissions focus stakeholders on commitment to better the community and local government operations environment and move toward a more sustainable future.

2013 GHG INVENTORY SUMMARY

Community-wide and local government operations greenhouse gas (GHG) emissions inventory conducted in 2012 and reported in the 2013 GHG Inventory Report provide the benchmark to measure efforts to reduce energy use and emissions reduction. The following is an excerpt from the 2013 GHG inventory report summarizing the City of Maplewood Emissions findings to reference for emissions reductions strategies in this Climate Action Plan.

COMMUNITY-WIDE GHG EMISSIONS FINDINGS

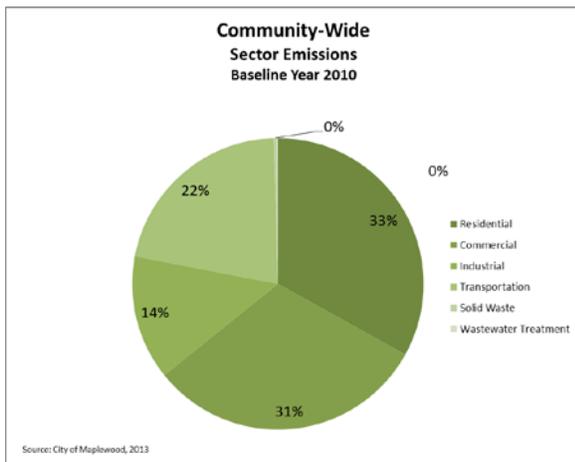


Figure 6: Community-Wide Sector Emissions Baseline Year 2010

The six sectors previously outlined respectively make up the Community-Wide GHG emissions. In total sum, Community-Wide GHG emissions in baseline year 2010 reached a total of 103,855 mt CO₂e. Figure 13: Community-Wide Sector Emissions Baseline Year 2010 shows the percentage contribution of each sector. In Maplewood Residential and Commercial sectors practically split the majority of GHG emissions in half. Residential homes, apartments and condos created the most GHG emissions in baseline year 2010 at thirty-three

percent of the Community-Wide emissions. The commercial sector follows closely at thirty-one percent. Although Figure 14 indicates that the Solid Waste and Wastewater Treatment sectors have no impact on Community-Wide emissions, previous sections highlighted each sectors contribution. Yet it is worth noting that both the Solid Waste and Wastewater Treatment percentage is so small that it made up less than one percent and too small to factor on the pie chart above.

Figure 14: Community-Wide Source Emissions provides another perspective of the total 103,855 mt CO₂e in baseline year 2010. Of the six categories of sources that make up Community-Wide GHG emissions, Purchased Electricity from all sectors is responsible for fifty percent of the GHG emissions in Maplewood; natural gas and gasoline round out the majority of the remaining emissions percentage.

Maplewood's residents and business utilize many hours of purchased electricity to create a thriving community, and that usage results in the largest portion of source emissions.

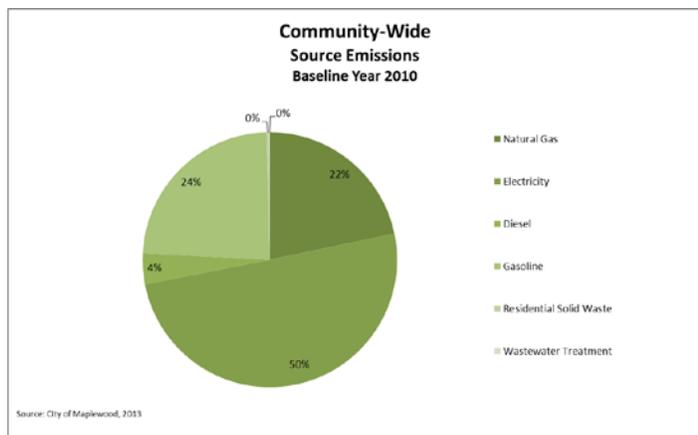


Figure 7: Community-Wide Source Emissions Baseline Year 2010

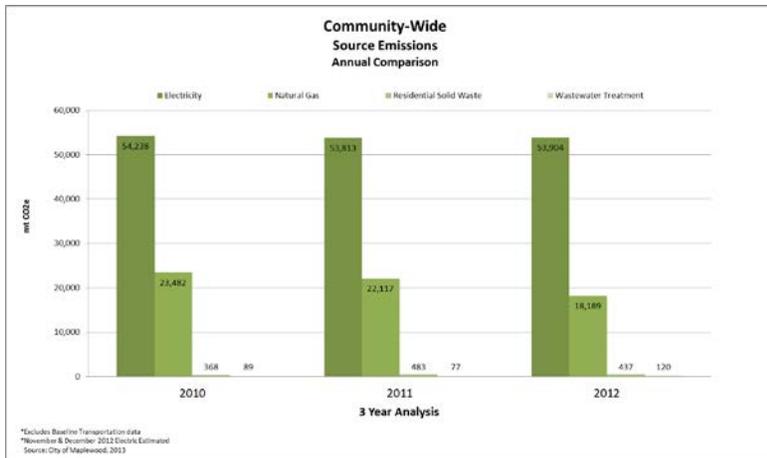


Figure 8: Community-Wide Source Emissions 2010, 2011 & 2012 Annual Comparison

& 2012. Conversely, the bar graph shows a downward trend in natural gas usage. Specifically, in baseline year 2010 natural gas emissions were at a high of 23,482 mt CO₂e and decreased to 23,117 mt CO₂e in 2011, and dropped further to 18,189 mt CO₂e in 2012. Additionally, residential solid waste and wastewater treatment figures reflected in the bar chart help to illustrate the reason GHG emissions impact is shown as zero percentage in Figure 14: Community-Wide Source Emissions. Furthermore, diesel and gasoline emissions were omitted from the bar chart annual comparison since baseline year 2010 transportation data would remain constant over a three-year period.

An annual comparison of Community-Wide Source emissions over three years illustrates the consistent usage of purchased electricity over a three-year period in Maplewood. As Figure 15: Community-Wide Source Emissions shows, purchased electricity has hovered around fifty-four thousand mt CO₂e in 2010, 2011

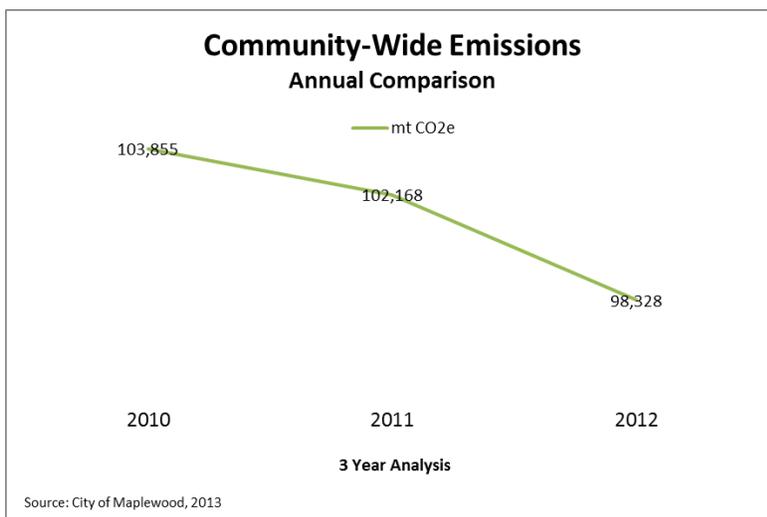


Figure 9: Community-Wide Emissions Annual Comparison 2010, 2011 & 2012

however, the aggregate reduction is five percent over a three-year time period.

The baseline year 2010 GHG emission of nearly 104 thousand mt CO₂e reflects a three year emissions high compared to 2011 and 2012. Moreover, as Figure 16: Community-Wide Emissions demonstrates, emissions fell from 2010 to 2012 by just over 5,500 mt CO₂e. The steep graphical downward trend alludes to a significant decrease in Community-Wide emissions;

LGO GHG EMISSIONS FINDINGS

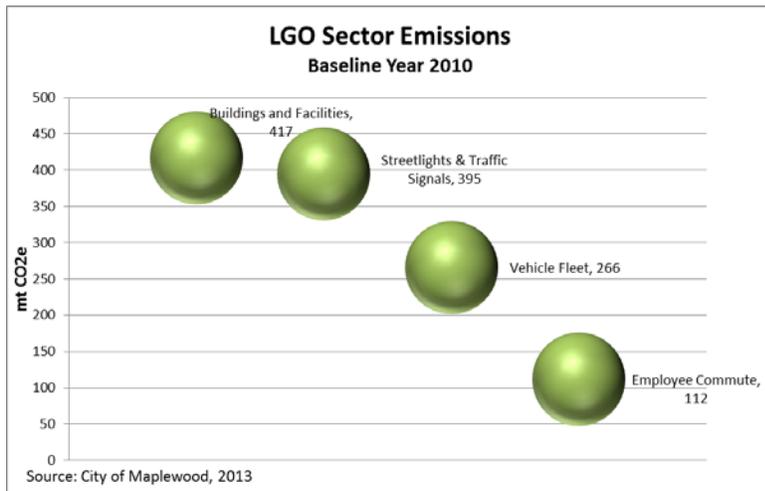


Figure 10: LGO Sector GHG Emissions Quantity Baseline Year 2010

Local Government

Operation GHG emissions in baseline year 2010 reached a total of 1,190 mt CO₂e. As Figure 27: LGO Sector GHG Emissions Quantity shows Buildings and Facilities in Maplewood led the four sectors evaluated with 417 mt CO₂e. City Hall and the Aquatic Center made up the majority of Buildings and Facilities in LGO emissions

in the depicted graph and in all other years researched and analyzed. Purchased Electricity used for street, parking and traffic lights resulted in 395 mt of CO₂e.

To better understand how emissions are divided amongst the LGO sectors and analyzed in this report Figure 28: LGO Sector GHG Emissions Percentage graphs the percentage of emissions contributed by each sector in baseline year 2010. As mentioned above, Buildings and Facilities makes up the greatest percentage of LGO emissions at 35%, followed by Street Lights and Traffic signals. Employees traveling to and from Maplewood to work make up only 10% of emissions attributable to the City of Maplewood’s LGO, equating to just over 1 ½ mt CO₂e per employee in baseline year 2010

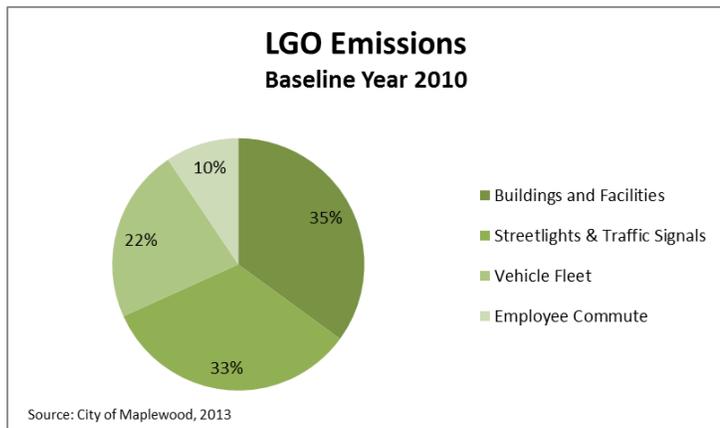


Figure 11: LGO Sector GHG Emissions Percentage Baseline Year 2010

An annual comparison of LGO emissions by sector revealed a downward trend in emissions for the City of Maplewood. As mentioned prior in the report, the Employee Commute Survey responses referenced baseline year 2010. With only small fluctuations in LGO personnel from 2010 through 2012, the survey responses acted as a consistent baseline for all three years

in an annual comparison of LGO emissions. Figure 29: LGO Sector GHG Emissions graphs the downward steps in emissions in each LGO sector from 2010 to 2012. Buildings and Facilities in the Maplewood LGO have consistently reduced the mt CO₂e each year for the past three years.

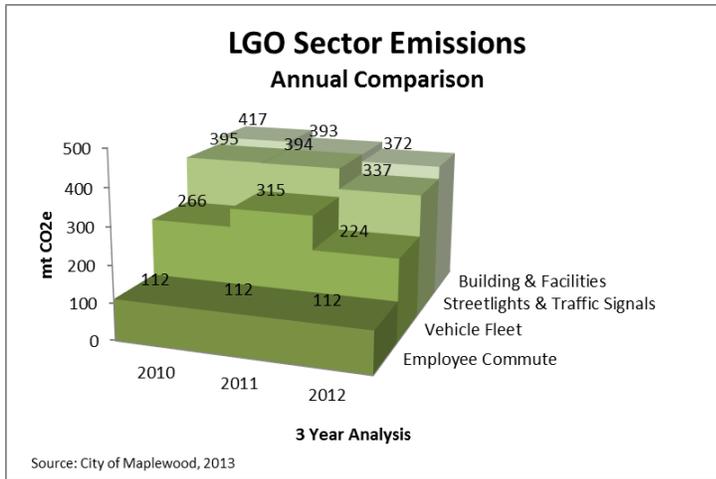


Figure 12: LGO Sector GHG Emissions 2010, 2011, & 2012 Annual Comparison

Specifically, the Buildings and Facilities emissions have reduced from a baseline year high of 417 mt CO₂e to 372 mt CO₂e in 2012. It appears from the graph that Streetlights and Traffic signals have also slightly decreased in emissions. However, as previously mentioned, the last quarter of lighting data in 2012 was unavailable and is likely reflected in the slight reduction in Figure 29. Nevertheless, street

lights and traffic signals have not experienced an increase in emissions and will likely remain consistent in future years. The LGO Vehicle Fleet has fluctuated historically, and will continue to fluctuate in future years dependent on municipal public works projects and emergency response. It is worth noting that 2012 was a three-year low for LG Vehicle Fleet emissions at 224 mt CO₂e.

Figure 30 provides the snapshot of three years of LGO emissions. Graphically, it is visible that the City of Maplewood LGO emissions are trending downward from the 2011 CO₂e high of 1,214 mt. The 145 mt CO₂e reductions from 2010 to 2012 reflect the efforts the LGO has made to reduce its buildings and facilities energy usage and vehicle fleet fuel consumption over time.

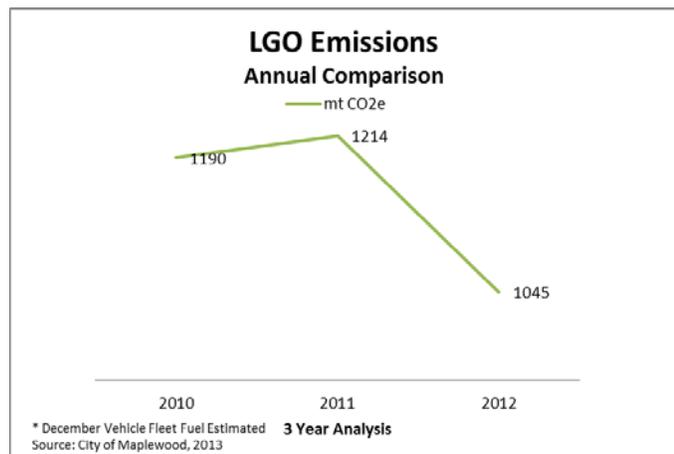


Figure 13: LGO GHG Emissions 2010, 2011 & 2012 Annual Comparison

ACTIONS IMPLEMENTED SINCE BASELINE YEAR 2010

The City of Maplewood community-wide and local government operations have taken steps to reduce energy use and emissions prior to conducting the GHG inventory report. The 2010 City Hall renovation significantly reduced energy usage in that building. As a result of that renovation, currently Maplewood City Hall, the Aquatic Center and the Public Maintenance Building have optical light sensors in place to reduce lighting energy usage. Energy efficiency was also addressed in the renovation with the installation of new low-e argon gas windows and air handling performance testing. Progressing into 2011, the City Manager implemented temperature directives no cooler than 75° when air conditioner is running in the warmer months and no warmer than 72° when the heating system is in use during the cooler months. As part of this new policy, digital thermostats were installed to control the mandated temperature settings. In 2012, the City Hall entrance sign was upgraded to LED lights, reducing energy consumption and emissions.

A combination community-wide and LGO approach to reduce energy consumption and emissions in municipal buildings and facilities was implemented with Aquatic Center usage policy. As of 2010, due to the infrequent use of pool heating, Maplewood eliminated municipal financed pool heat for users, reducing boiler natural gas consumption. While pool heating is available for use, city policy now states that the end user must reimburse the city for heating the pool. Furthermore, effective 2013, Maplewood has replaced the deep fryer in the Aquatic Center with an energy star, efficient convection oven to bake healthier concession items and reduce energy consumption and emissions.

In 2012, the Public Works Maintenance Building remodeled the offices and facilities creating a much more energy efficient environment for public works employees. The office area renovation included insulation for offices and shower facilities where there was none previously. These updated public works facilities will likely result in a long-term reduction in energy use and emissions at the maintenance building.

Another emissions reduction effort in all of the city facilities prior to the GHG inventory report was the utilization of recycling through the solid waste service provider. Paper products are recycled in all city buildings by municipal staff. Streamlined recycling services are provided in all of the municipal parks and the city's business district. As of 2012, the solid waste service provider is tracking Maplewood's recycled products volume, better measuring emissions reduction for the municipality.

LGO vehicle fleet fuel consumption is variable. A variety of unforeseen and uncontrollable factors influence LGO fleet fuel consumption including inclement weather, traffic

and property incidents. In 2010, Maplewood experienced the highest vehicle miles traveled (VMT) and fuel usage in the municipality's Public Works vehicle fleet in some years as a result of severe inclement weather. During the 2010 winter season, on one severe weather occasion, the Public Works Department conducted seventy-two hours constant street treatment and retreatment to ensure the safety of Maplewood's roads. The high-volume salt usage in 2010 resulted in the policy implementation to utilize a mixture of beet juice and salt to treat and retreat iced streets in Maplewood. The mixture is more environmentally friendly than other chemical treatments, and is a more efficient treatment of iced streets resulting in less retreatment, reducing VMT for road treatment in inclement weather. The reduction in VMT from utilizing the beet juice and salt mixture deicer directly reduces fuel usage causing a decrease of transportation emissions from the LGO Public Works vehicle fleet.

Mitigation of unforeseen and uncontrollable situations to reduce fuel consumption for Maplewood's municipal vehicle fleet is limited. With that in mind, the City is currently in the process of addressing fuel consumption in the fire, police, and public works departments. As part of Maplewood's standard vehicle replacement policy, the City has diligently recycled vehicles from one department to another to maximize usage. Additionally, the city is gradually rotating more fuel-efficient vehicles into its fleet. Specifically, one example of fuel reduction through more fuel-efficient vehicles is the Public Works department's replacement of code enforcement officer vehicles with Ford Fusion Hybrids. Lastly, the Police Department has added the Ford Taurus to its fleet for better gas mileage compared to the Crown Victoria's.

EMISSIONS REDUCTION STRATEGIES

Greenhouse gas emissions reductions in community-wide and local government operations will occur with participation of community-wide stakeholders and local government operations staff. Stakeholder involvement and contributions that change anthropogenic activities result in source emission reductions by sectors in the long run. Tracking and measuring these reductions over a specified period of time resolves the long-term reduction targets. The following planned emission reduction recommendations by boundary, sector and source, outline the necessary participation strategy to reduce emissions.

National, regional and local collaborative programs will need to be utilized to aid in funding the recommendations, and set goals to reduce energy consumption and GHG emissions. Locally, the U.S. Green Building Council (USGBC) – Missouri Gateway Chapter has limited scholarships available to assist individuals in acquiring LEED Associate Certification.⁷ The USGBC also has a variety of ongoing educational programs and events to inform all stakeholders of methods and opportunities to implement green building practices and affect climate change FOCUS St. Louis recently introduced OneSTL to address the St. Louis regions sustainability initiatives collaboratively.⁸ As part of the OneSTL, municipalities will have access to a data base that provides information on best practices to reduce energy consumption and GHG emissions, among other sustainability initiatives.

At a state level, Missouri has made Qualified Energy Conservation Bonds (OECBS) available to aid public facilities in funding energy conservation projects.⁹ Statutory financial support directed at projects to improve energy consumption are a great asset for municipalities to utilize as they progress toward a more sustainable future. Property Assessed Clean Energy Program (PACE), another green energy financing mechanism, was established to help home and business owners with energy efficiency remodeling and new construction projects.¹⁰ PACE is an available option in Missouri as of 2006.

From a national perspective, the Department of Energy, Department of Conservation, Environmental Protection Agency, and various other federal agencies grant funding each year

⁷ USGBC Missouri Gateway Chapter (St. Louis, MO: USGBC St. Louis, 2012)
<http://www.usgbc-mogateway.org/>

⁸ "ONESTL." – Regional Sustainable Development (2013) FOCUS ST.LOUIS 2013 Web.
<http://www.focus-stl.org/CitizenEngagement/OneSTL.aspx>

⁹ "Qualified Energy Conservation Bonds." Department of Economic Development. (2013). State of Missouri. 2013 Web.

¹⁰ "Property Assessed Clean Energy Program. Renew Missouri Advancing Energy Efficiency and Renewable Energy." (2006) Renew Missouri 2013 Web. <http://www.renewmo.org/pace.html>

to support green projects that promote energy efficiency and long-term sustainability efforts. In addition to each individual departments grant funding postings on their respective websites, the East West Gateway Council of Governments published grant information in their weekly publication. Maplewood would be well served to monitor available grant funding and apply for grant opportunities

COMMUNITY-WIDE PLANNED EMISSION AND ENERGY CONSUMPTION REDUCTION

It is important to note that reducing energy use and GHG emissions in the City of Maplewood for a population of approximately 8,044 and municipal households of 4,572 is a great undertaking. Planned reductions in each of the community-wide sectors outlined below will be better achieved with local administrative oversight. In addition to the Sustainability Commission formal citizen participation in the form of a *Community-Wide Energy and Emissions Reduction Task Force* will provide the municipality the necessary oversight required to meet recommendations and set goals to reduce energy and GHG emissions.

The following recommendations for community-wide energy consumption and GHG emissions reduction are a compilation of common best practices in sustainability initiatives. Additionally, some suggestions are based on ideas from the Maplewood Sustainability Commission members and municipal staff, as well as concerned citizens and business owners living and working in Maplewood.

RESIDENTIAL, COMMERCIAL, & INDUSTRIAL

The three community-wide sectors of the built environment will need to address both energy consumption and emissions reduction through the sources identified in the 2012 GHG inventory report. The following recommendations for reduction in each of the source emissions establish a framework of ideas to work toward energy efficiency and emissions reduction.

NATURAL GAS COMPANY

Residential and commercial businesses make up the greatest percentage of emissions in Maplewood community-wide. It is critical that buildings in the City of Maplewood must become more energy efficient by 2020 in order to reduce emissions and meet target reduction goals.

Maplewood residential households can begin to reduce natural gas consumption, thereby creating fewer emissions by consistently regulating household temperatures. Residents' conscious efforts to better control the temperature of their households help to address energy consumption. Scheduling the thermostat to a consistent temperate setting during the cooler months of the year, instead of fluctuating highs and lows is a more efficient usage of natural gas.

Commercial businesses can also regulate their thermostats to a consistent temperature setting during the fall and winter seasonal temperatures. It is recommended that Maplewood businesses set internal company policy to regulate the temperatures of facilities to ensure maximum natural gas usage efficiency during the fall and winter seasons.

Natural Gas service providers outline temperature settings for the St. Louis region to ensure optimal usage of the natural resource. Residents can contact their local service provider with questions about temperature regulation and other opportunities where they can assist their community in energy efficiency initiatives.

PURCHASED ELECTRICITY

As illustrated in the 2013 GHG inventory report and summary section of this plan, in all three sectors combined, purchased electricity consumption contributes the greatest percentage of emissions in the City of Maplewood. Like natural gas, purchased electricity consumption reduction can also be better controlled by temperature regulation. It is recommended that Maplewood residents, businesses and industry establish temperature regulation in their households and facilities to reduce energy consumption and GHG emissions. Setting the thermostat to a consistent temperate setting during the warmer months of the year, instead of fluctuating highs and lows is a more efficient usage of purchased electricity.

Purchased electricity service providers outline temperature settings for the St. Louis region to ensure optimal usage of the natural resource. Residents can contact their local service provider with questions about temperature regulation and other opportunities where they can assist their community in energy efficiency initiatives.

Additionally, it is recommended that residential households and businesses and industry facilities regulate lighting and technical equipment. Having standards in place in your home and business to turn lights, computers, printers, TVs, appliances, and other technical equipment off when it is not in use is more energy efficient and reduces GHG emissions. A concerted effort to consume less electricity in homes and business will aid Maplewood in reaching it's 10% GHG reduction by 2020.

TRANSPORTATION

Nearly a quarter of total community-wide emissions are a result of transportation within Maplewood jurisdictional boundaries. Eighty percent of that quarter stems from light truck and passenger cars emissions. Personal vehicle usage is more commonplace in the St. Louis metropolitan region compared to other metropolitan areas, and greatly contributes to GHG emissions. More expansive use of public transit, along with carpooling, bicycling and walking will all reduce transportation emissions. Moreover, wider usage of public transportation and alternative methods of travel will likely reduce petroleum consumption, directly ensuring less petroleum distribution throughout the region and thereby reducing emission further. Again, approaching transportation emissions reduction with the Maplewood Task Force comprised of residents, businesses, and industry stakeholders interested in transportation emissions reduction can help to facilitate efforts, projects, and programs to reduce petroleum based emissions. Maplewood has great access to the Metrolink Maplewood Station. Increased ridership on Metrolink is an asset to reducing emissions over the long run. It is recommended that business and industry stakeholders in Maplewood work directly with Bi-State to offer employees working in Maplewood a lower cost metro pass and encourage and promote use of the St. Louis region public transit system. Other metropolitan areas have considered pre-tax transit passes through employers. Additionally, it is recommended that the City of Maplewood work directly with Bi-State to explore supplying all Maplewood residents with a metro pass for a set fee as part of occupancy permitting in the city; the sale of these passes could include an incentive to invest more in Maplewood public transit infrastructure

The *Community-Wide Transportation Emissions Reduction Task Force* can also supplement coordination of programs mentioned above with research and support to the city of Maplewood in infrastructure projects that may reduce petroleum consumption and GHG emissions community-wide. Some research suggests that circular intersections, (roundabouts), better manage traffic congestion, safety, and emissions. Vehicle idling at traditional stoplight intersections has contributed to transportation source emissions. Constant traffic flow through circular intersections reduces vehicle idling at traditional stoplight intersections consequently lessening GHG emissions. Additionally, speed control and driver attention through circular intersections is better managed through roundabouts increasing public safety and reducing energy consumption and GHG emissions. Furthermore, removal of existing stoplights at traditional intersections reduces purchased electricity energy consumption and GHG emissions.

It is recommended that Maplewood consider having a *Community-Wide Transportation Emissions Reduction Task Force* evaluate the possibility of developing circular intersection infrastructure at major intersections in the city's municipal jurisdiction. Specifically, the task force could examine the opportunity to convert traditional stoplight intersections at Manchester and Hanley Road and Manchester and Big Bend Boulevard to constant traffic flow roundabouts. While major infrastructure conversions of this type are expensive, an initial analysis of long-term benefits by the task force in coordination with all municipal stakeholders will likely reveal expected and unexpected reductions in not only energy consumption and GHG emissions, but also in public safety, and local government finances and administration.

Lastly, the task force should also explore the opportunity to develop a community-wide project to work with the City of Maplewood to install bicycle racks along the Manchester Road and Sutton Avenue. It is likely that added bicycle access will link Maplewood retail corridors, while reducing fuel usage and GHG emissions. This recommendation continues to encourage the ongoing development of Maplewood as a walkable and bikeable community.

SOLID WASTE

The “Reduce, Reuse, Recycle” slogan is commonly used today. Still, Maplewood deposited over 3,000 tons of solid waste in 2012. Current single stream recycling services are a great asset to community-wide green initiatives. As of 2012 the local solid waste service provider for Maplewood is tracking recycling collection and can be contacted directly with questions or concerns about recycling and solid waste best practices.

In order for Maplewood to reduce more of the 3,000 tons deposited in landfills annually, it is recommended that business and residents of Maplewood consider composting to help reduce waste that the solid waste provider is required to collect. Composting food and landscaping waste is a great way to improve recycling efforts and reduce GHG emissions. Different composting options are available at a community-wide level. Composting service providers can contract directly with business, specifically Maplewood restaurants and provide a composting service. Another option is for business and residents alike to set up a composting site at their respective properties. It is recommended that the newly organized *Community-Wide Energy and Emissions Reduction Task Force* develop and promote an educational program together with the City of Maplewood, local business and residents to inform Maplewood stakeholders about composting opportunities and benefits.

STORM WATER TREATMENT

The “Reduce, Reuse, and Recycle” slogan is also applicable to storm water treatment initiatives. As discussed in the 2013 GHG inventory report, storm water, identified as wastewater, treatment uses purchased electricity to process and treat contaminated storm and waste water. To reduce energy consumption in storm water treatment, storm water can be collected in rain gardens with plants and vegetation that absorb storm water and create an attractive green scape. Additionally, rain barrels can be utilized by residents and business to collect and recycle storm water for uses such as watering plants and grass or washing automobiles. This type of recycling requires a small upfront cost and little long-term investment, but provides a significant return, especially in times of drought. When the region is experiencing drought and purchased electricity energy usage for storm water processing is reduced, it is more efficiently utilized for other service provisions. Bio-swales and permeable pavement are also considered to be best practice management options that reduce treatment of storm water which reduces energy usage over the long run. Business and residents are recommended to incorporate as many of the storm water best practice management tools available. It is also recommended that the *Community-Wide Energy and Emissions Reduction Task Force* develop and promote an educational program in concert with the City of Maplewood, local business and residents, that provide Maplewood stakeholders the opportunity to connect and visualize storm water best practice management tools. The Missouri Department of Natural Resources and the East West Gateway Council of Governments provide resources on storm water management.

Lastly, it is recommended that the *Community-Wide Energy and Emissions Reduction Task Force* investigate the opportunity to establish a tree planting program in the City of Maplewood that will allow for healthy growth of larger shade trees along major urban corridors. Large trees absorb and store large quantities of CO₂e, provide shade and create natural cooling through the absorption and evaporation of water. This mitigates the urban heat island effect. Moreover, healthy tree planting allows larger quantities of water to be absorbed and aids in natural storm water management. Maplewood is listed as a “Tree City USA” and it is also recommended that the City work with the Task Force to educate citizens to select drought tolerant species from the tree listing for their personal plantings to reduce the need to irrigate for successful growth.

LGO REDUCTION MEASURES

Local Government Operations planned emissions reductions for sectors and scopes in the City of Maplewood are important to the municipality meeting its ten percent target reduction goal by 2020. Like community-wide strategies, LGO planned reductions in each of the LGO sectors and scopes outlined below will be better achieved with local administrative oversight. In addition to the Sustainability Commission, formal citizen participation in the form of a *LGO Energy and Emissions Reduction Green Team Task Force* will provide the municipality the necessary oversight required to meet recommendations and set goals to reduce energy and GHG emissions. The *LGO Green Team* should work directly and closely with the Sustainability Commission, city administration and staff to assist with energy use and emission reduction programs project creation, coordination, adoption, and implementation, in order to effectively reduce energy consumption and GHG emissions in Local Government Operations.

The following recommendations for LGO energy consumption and GHG emissions reduction are a compilation of common best practices in sustainability initiatives. Additionally, some suggestions are based on ideas from the Maplewood Sustainability Commission members and municipal staff, as well as concerned citizens and business owners living and working in Maplewood.

BUILDINGS & FACILITIES

Maplewood LGO buildings and facilities makeup over a third of the LGO emissions as previously mentioned in the GHG inventory summary. While many energy consumption and emissions reduction initiatives have already been implemented as a part of facility renovations and administrative directives, the City of Maplewood must continue to introduce strategies that will positively impact LGO energy use and emissions to move toward the target reduction goal of 10% by 2020.

To continue improving on City Hall's 2010 renovation, it is recommended that the *LGO Green Team* work with the Maplewood commissions, officials and staff to evaluate the costs and benefits of a new roof for the main municipal building. Due to the age of the City Hall roof replacement will be required in the future. A variety of energy efficient options are available for commercial roofing. A cool roof, also known as a white roof is an option for City Hall. Cool roofs reflect infrared and ultraviolet sunrays with a light colored high solar reflective index

surface, which lessens the heat transfer on the rooftop. The Department of Energy has a cool roof calculator available on its website to assist with the evaluation of this roofing option.¹¹

Maplewood will also want to evaluate and compare the option of installing a green roof at City Hall. Like a cool roof, a green roof is another type of energy efficient and emissions reducing roofing option. A green roof, sometimes referred to as a living roof, is comprised of soil and vegetation planted on top of a water barrier membrane. Also like a cool roof, a green roof's planted materials absorb harmful infrared and ultraviolet sunrays and lessen the heat transfer on the roof surface. Additionally, the soil and plants absorb precipitation, decreasing the runoff associated with other roof types. Green roof absorption helps to eliminate the energy used to traditionally process storm water which positively impacts GHG emissions.

In considering City Hall roofing options it is also recommended that the *LGO Green Team* in coordination with the municipality, evaluate the potential of solar panel installation on each its facilities. Solar panel installation may be used in conjunction with sustainable roofing options to offset purchased electricity costs. Specifically, solar panel installation on the Maplewood Aquatic Center rooftop could be incorporated to generate energy for services provided in the concession and lobby during the spring and summer months. Energy credits could be issued during winter months when the concession and lobby are not in use.

In addition to addressing City Hall roofing, further modifications to facility buildings including insulation installation or replacement for a greater R-Value to avoid heating and cooling loss will be an asset to energy consumption and emissions reduction efforts. Specifically, City Hall will benefit by installing insulation between the ceiling tiles and the roof top to reduce energy consumption and emissions, as well as conserve indoor temperature settings pursuant to administrative directives.

It is also recommended that administrative policy be implemented mandating office equipment energy conservation. Computers, phones, calculators, printers and other electronic equipment that steadily draw purchased electricity must be turned off daily to maximize energy consumption and GHG emissions reduction. Furthermore, lights in cubicles should also be turned off when an employee leaves their assigned area for lunch or extended periods of time. A municipal policy regulating employees to turn equipment off daily will impact energy and emissions reduction overall, and help Maplewood meet its 10% emissions target reduction by 2020.

¹¹ Department of Energy, Cool Roofs. 2013 <http://www.ornl.gov/sci/roofs+walls/facts/CoolCalcEnergy.htm>

Maplewood Deer Creek Park and Ryan Hummert Park both utilize natural gas for furnace heating in the restrooms. It is recommended that the *LGO Green Team* examine and evaluate the costs and benefits of closing the restrooms during the winter months from December 1st to March 1st to eliminate natural gas usage for furnace heating. The energy consumption and emissions reduction impact is likely very small but should be evaluated by the municipality as a target reduction option.

It is also recommended that the *LGO Green Team* research and evaluate the addition of storm water landscape best management practices.¹² The potential to select and include native plant species to develop habitats in Maplewood parks that will better manage storm water runoff will aid Maplewood in reducing its energy usage and GHG emission in order to meet the 10% emissions target reduction goal. Energy used to process runoff is mitigated with native plantings and is a viable option for the municipality.

Other practical energy savings that are feasible LGO implementations are: mandating a public works maintenance building clean-up day four times a year. Public Works Employees contributing one day each quarter to cleanup and maintain the public works maintenance building will eliminate fuel usage of public works vehicles on clean-up day. While the savings is likely small the overall benefit four times each year will help Maplewood meet its 10% target reduction by 2020.

The adoption of the 2009 International Energy Conservation Code is recommended for both residential and commercial buildings in Maplewood's jurisdiction. As part of the adoption of international energy standards it is also recommended that the City of Maplewood, with support of the *LGO Green Team* and the Sustainability Commission, consider conducting an expansive energy audit of municipal facilities. An Energy Services Provider Company (ESCO) conducts in-depth energy audits including cost benefit analysis of energy efficient options. In some instances the municipal energy savings pay for the services from ESCOs. Additionally, State of Missouri grants and programs may be available to assist municipalities with ESCO evaluations and other energy savings projects.

Lastly, it is recommended that the City of Maplewood implement requirements for all new construction and major renovations, 10,000 square feet or greater or \$1 million or greater, within the city's jurisdiction to meet LEED Green Building Rating System of Silver Level or higher. This recommendation is similar to other St. Louis metropolitan local municipality's requirements. Additionally, it is also recommended that Maplewood's zoning ordinances be

¹² Landscape Guide for Stormwater Best Management Practice Design, MSD, 2012.

reviewed and updated to require open space and green space preservation to mitigate over paving in Maplewood and help address storm water treatment energy conservation and GHG emissions. A wider use of pervious pavements is a more energy efficient option to for consideration when evaluating open space and green space preservation.

STREET & PARKING LIGHTS

It is recommended that the *LGO Energy and Emissions Reduction Green Team* coordinate with community stakeholders, including residents, business and industry, Maplewood municipal government, St. Louis County, and Missouri Department of Transportation to investigate and evaluate current parking, street, and traffic lighting usage. With specific knowledge about current lighting, the Green Team can begin working with government entities to help develop a schedule to replace current lighting with energy efficient light bulbs and fixtures where applicable. A variety of more energy efficient options are available including LED lamps. While there are no known current working models suggestions have also been made to consider Algae street lamp's costs and benefits as an option.

VEHICLE FLEET

As previously noted, LGO vehicle fleet fuel consumption is variable. Maplewood's opportunities to reduce fuel usage and emissions without reducing municipal service provisions to stakeholders are limited. The following recommendations highlight additional considerations for Maplewood LGO to evaluate costs and benefits of implementation. It is recommended that the *LGO Energy and Emissions Reduction Green Team* work with Maplewood stakeholders, the Sustainability Commission and City officials to consider alternatives to reduce Maplewood's vehicle fleet fuel usage.

In order to reduce fuel consumption during the summer months when gasoline prices peak, it is recommended that the Maplewood Police Department study alternative patrolling options. Considering the VMT that occur daily within Maplewood's jurisdiction, the municipality could examine the costs and benefits of motorcycle patrol. Incorporating motorcycle patrol in addition to patrol cars will reduce fuel consumption and will likely create financial savings during summer fuel peak pricing. Motorcycle patrol will also contribute less GHG emissions than patrol cars, assisting Maplewood in reaching its emissions target reduction of 10% by 2020.

Furthermore, bicycle and foot patrol are both options the Police Department may consider as alternatives.

The City of Maplewood currently has a policy and schedule to replace municipal vehicle fleet. Maplewood is incorporating more fuel efficient and lower-emitting vehicles into the department fleet rotation by purchasing a Ford Fusion for the Public Works Department and a Ford Taurus for the Police Department. National fuel efficiency standards on future model vehicles will continue to improve and increase fuel consumption for Maplewood as it purchases and rotates new vehicles into the departmental fleets.

Long-term vehicle fleet cost benefit analysis by the *LGO Green Team* and Maplewood stakeholders could include research and evaluation of installing solar powered electric car charging stations at the Marietta parking lot.

EMPLOYEE COMMUTE

Employees commuting to work in Maplewood can take individual steps, in addition to their current efforts, to decrease their individual fuel consumption and GHG emissions contribution attributable to Maplewood. It is recommended that where possible employees increase ride sharing and carpools to work. Additionally, employees who live a short distance from their jobsite have the choice to walk to work instead of driving. Employees who do not live within walking distance of their jobsite with the City of Maplewood could consider purchasing a more fuel efficient vehicle, alternative fuel vehicle or possibly a scooter to commute to and from work.

LGO opportunities to contribute to the employee commute fuel consumption and greenhouse gas emissions reduction are varied. The City of Maplewood could potentially consider introducing a telecommuting or working from home schedule for employees who can electronically remotely access their work from home. Additionally, Maplewood employees could potentially work a flexible time schedule of four, ten-hour days. Recent conversation and some research has examined that service oriented industries, including municipal government, can save overall energy costs and reduce greenhouse gas emissions by implementing a ten-hour, four-day week schedule as opposed to an eight-hour, five-day week schedule. Longer hours, four days a week, provide an opportunity for community stakeholders to access municipal services later in the day, making services more available. Closing administrative services on a Friday reduces energy consumption and greenhouse gas emissions weekly. Based on baseline year usage, in the aggregate, if the municipality closes for fifty-two working days annually, the

potential energy savings would average over 100,000 kWh and over 2000 therms translating to approximately over \$10,000 savings factoring 2010 pricing.

Lastly, a new approach for employers has been implementing a municipal employee volunteer program day for municipal employees to dedicate one work day volunteering for a non-profit organization of their choice. There are a variety of employee volunteer programs. Some employers compensate employees for dedicating one work day to volunteering for a non-profit organization. With employees participating in a volunteer day employee commute fuel is reduced. It is recommended that the City of Maplewood consider implementing an employee volunteer program day to aid the community and reduce GHG emissions among Maplewood employees.

CONCLUSION

The recommendations included in the Emissions Reduction Strategy section of this plan address *Milestone 3, Developing a Climate Action Plan* of ICLEI's five milestone process. The recommendations for The City of Maplewood to reach its greenhouse gas emissions target reduction goal of 10% by 2020 will be achieved with ongoing effort by municipal stakeholders. Participation and collaboration among stakeholders is the most important component outlined in this plan. While the ideas and recommended strategies described in the plan are merely guidelines, they will move the municipality toward a more sustainable future with a concerted effort.

The first step is to complete *Milestone 4, Implement Climate Action Plan*. With the adoption and implementation of this Climate Action Plan by the Maplewood Sustainability Commission and the Maplewood City Council the municipality is setting the guidelines of this plan in motion. Official support of this plan illustrates Maplewood's commitment toward energy consumption and GHG emissions reduction.

Following the completion of *Milestone 4*, Maplewood will also need to implement policy to address *Milestone 5, Monitor and Evaluate Progress*. As previously described The City of Maplewood, through the Sustainability Commissions, future task forces, local government officials and staff can monitor and evaluate future energy consumption and GHG emissions. Together these groups can utilize funding opportunities to hire external consultants to conduct future years' inventories. Additionally, report and coordination with local utilities to implement electronic distribution of energy consumption data will accelerate future monitoring and tracking. Lastly, internal local government operations departmental policies to electronically track transportation fuel consumption or obtain transportation fuel consumption from service providers will also accelerate future monitoring and tracking.

Overall, it is evident that the City of Maplewood's efforts to date have reduced emissions from baseline year 2010 through 2012. The residents, business owners, industry and employees of Maplewood are conscientious about the activities they are engaged in that contribute to the byproducts in their environment. What is more, Maplewood stakeholders' efforts are creating a healthy, prosperous and friendly community.

APPENDIX A: LIST OF ACRONYMS AND ABBREVIATIONS

CAP	criteria air pollutant
BIO-CO ₂	Biological Carbon Dioxide
BTU	British Thermal Units
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide equivalent
CH ₄	Methane
GHG	Greenhouse Gas
GIS	Graphic Information System
GWP	Global Warming Potential
HFC	hydroflourocarbon
ICLEI	Local Governments for Sustainability
kWh	kilowatt hour
mt	metric tonnes
mm	million metric
MSD	Metropolitan Sewer District
N ₂ O	Nitrous Oxide
PFC	Perfluorocarbon
SF ₆	Sulfur Hexafluoride
VMT	Vehicle Miles Traveled
WWTP	Wastewater Treatment Plant

APPENDIX B: FUTURE MONITORING AND TRACKING

The following list will provide assistance in future energy consumption and GHG emissions monitoring and tracking:

- Maintain ICLEI membership for assistance with GHG inventories and access to CACP 2009 software to calculate future emissions.
- Use of Climate and Air Pollution Planning Assistant (CAPPA) Tool for additional GHG emissions reduction strategies and to assess the cost-benefit of possible emission reduction strategies and recommendations.
- Continue to establish rapport with industry contacts to coordinate electronic distribution of municipal energy, fuel and water consumption, as well as storm water treatment and solid waste service provisions. A list of contacts utilized in the 2013 GHG inventory study is available in the GHG inventory training manual.
- Review opportunities with service providers for software compatibility to download and import electronic distribution of usage from service providers for tracking.
- Internal municipal policy changes for better tracking
- Establish funding to employ a consultant, intern, or fellow to conduct future years GHG inventories.
- Appointment by Maplewood City Council or City officials for a Maplewood stakeholder or municipal employee to monitor and track municipal energy consumption and calculate GHG emissions.

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