IMAGINE CENTRAL ARKANSAS

Plan Smart. Live Smart.

Sustainability and Greenhouse Gas Emissions Inventory

Working Paper #5

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G S & P

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STATE OF THE REGION: SUSTAINABILITY AND GREENHOUSE GAS EMISSIONS INVENTORY

This is the fifth in the series of white papers that will serve as background information for Imagine Central Arkansas. This paper includes the results of a greenhouse gas emissions inventory for central Arkansas. It also addresses ways that Imagine Central Arkansas can integrate the recommendations of the Green Agenda, the region's recent long-term sustainability initiative.

Highlights

- In 2010, central Arkansas generated approximately 14.3 million tons of equivalent carbon dioxide units (CO_2e) and consumed a total of 44.6 billion kilowatt hours (kWh) of energy.
- The transportation sector is the largest producer of greenhouse gases (GHG), accounting for almost one-third (32.4%) of GHG's in the region.
- The transportation sector is also the largest consumer of energy, responsible for over 36% of the region's total consumption.
- Central Arkansas per capita GHG emission rate is much higher than larger places such as Chicago and Portland, but lower than comparable places such as Louisville.
- The ability for central Arkansas to maintain itself as a region is directly linked to transportation choices.
- Imagine Central Arkansas represents a significant opportunity to implement the recommendations of the Central Arkansas Green Agenda.
- The GHG emissions inventory provides a useful benchmark for evaluating progress.

Background

Metroplan has been developing and integrating sustainability into existing operations as well as the community for over a decade. Addressing air and water quality along with long-term viability in central Arkansas has been a focus and has included cooperative efforts such as administering the Ozone Action Day program, collaborating to help protect Lake Maumelle from pollution, and in securing new long-term drinking water sources. To further expand Metroplan's sustainability program, an appointed Green Task Force was created to provide guidance and aid in the development of strategies to further implement sustainability initiatives across the region.

The Green Task Force conducted an extensive grassroots input process and developed a Central Arkansas Green Agenda (Green Agenda) which consists of multiple strategies for continuing regional sustainability initiatives. The Green Agenda includes four focus areas – movement, power, nature and knowledge. Many of the actions documented in the Green Agenda are complementary to the objectives of Imagine Central Arkansas.

Prior to engaging in discussions on future options for the region, it is first necessary to establish baseline conditions to serve as a basis for estimating future implications. One area of interest, air quality, has been addressed to better understand the extent and sources of central Arkansas' greenhouse gas (GHG) emissions. A GHG inventory is a key component of documenting baseline conditions.

The purpose of the baseline inventory is to provide an understanding of the current activities, sources, and distribution of emissions. In addition, the baseline GHG emission inventory also allows Metroplan to have a scientific basis for creating strat-

egies and policy-level decisions to ultimately reduce the GHG emissions from the region.

GHG Inventory

A comprehensive software tool - Clean Air & Climate Protection (CACP 2009) – was used to develop the GHG inventory. CACP 2009 is maintained by ICLEI - Local Governments for Sustainability, a non-profit organization designed to assist local governments with GHG emission inventories as well as sustainability planning.

The CACP 2009 software was used to develop Metroplan's inventory. The software contains thousands of factors to calculate emissions based on fuel, energy use, transportation and waste disposal data. The software has been utilized by over 200 cities and counties in the United States to quantify GHG emissions.

Scope of the Inventory

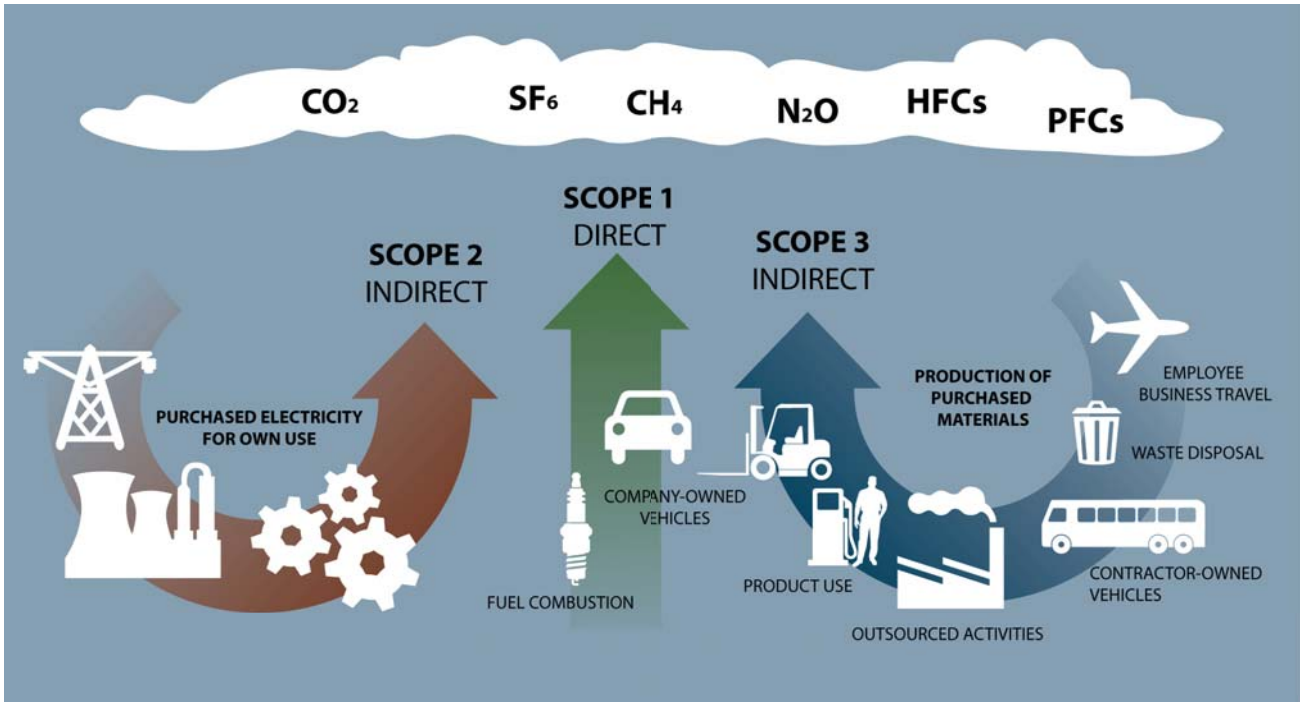
The scope of the GHG emission inventory includes Pulaski, Lonoke, Saline, and Faulkner Counties and associated emissions from community sources. Community sources of GHG emissions include, but are not limited to:

- Residential energy use;
- Industrial sources, and
- Regional transportation.

The baseline year for the inventory was selected as 2010 based on the following rationale:

- A national census was performed, resulting in the most current population data for the region;
- Amount of current and readily available information for input into CACP software, and
- General weather patterns observed throughout the year were not extreme. (Note: average summer temperature was the warmest on record at the time, but has since been surpassed, but no other major weather anomalies were noted).

Figure 1. Emission Sources



Source: US Environmental Protection Agency, 2011 (http://www.epa.gov/oaintrnt/practices/eo13514.htm)

In 2010, central Arkansas generated approximately 14.3 million tons of equivalent carbon dioxide units (CO2e) and consumed a total of 44.6 billion kilowatt hours (kWh) of energy.

The emissions included in the baseline GHG emission inventory include both Scope 1 and Scope 2 emissions. Scope 1 emissions are direct GHG emissions from sources that are owned or controlled by agencies in the CARTS area, such as emissions from fossil fuels burned onsite. Scope 2 emissions are indirect GHG emissions resulting from the generation of electricity, heating and cooling, etc. Scope 3 emissions were not included in this inventory.

Data from original sources, where available, were used and supplemented with available online statistics and resources, as necessary. Data were entered into the CACP 2009 software program using guidance from the *Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories (version 1.1)* and *ICLEI Community-wide Greenhouse Gas Inventory Instructions: CACP 2009 Data Entry & Quality Control*. The following tables and charts provide a summary of the software output from the community inventory.

The transportation sector is the largest producer of greenhouse gases (GHG), accounting for almost one-third (32.4%) of GHG's in the region.

2010 Baseline Inventory Results

In 2010, central Arkansas generated approximately 14.3 million tons of equivalent carbon dioxide units[1] (CO_2e) and consumed a total of 44.6 billion kilowatt hours (kWh) of energy.

The following chart presents the distribution of CO_2e for each sector evaluated in the inventory. The largest percentage of CO_2e emissions were from the transportation sector (32.4%). Overall energy consumption from the transportation sector was also the highest.

Transportation was evaluated using vehicle fuel efficiencies and total annual vehicle miles traveled within the boundaries of Pulaski, Lonoke, Saline, and Faulkner Counties. The sector does not include off-road sources such as construction equipment, trains, and aircraft. An estimated 79.5% of emissions from the transportation sector were generated from

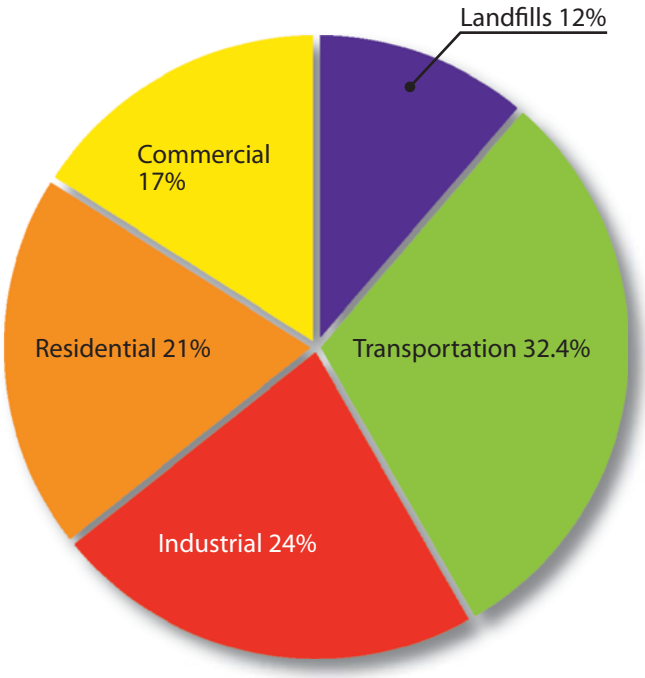
1 Reporting information in CO2e allows for consideration of differences in global warming potential (GWP) of each greenhouse gas. The term is used to describe the impact potential a greenhouse gas has to trap heat in the Earth's atmosphere relative to another gas. Specifically, the global warming potential for a particular greenhouse gas refers to the ratio of heat trapped by one unit mass of the greenhouse gas to one unit mass of CO2 over a specified period of time. For example, methane is a more potent greenhouse gas than CO2; methane has a GWP of 21 which means that 1 ton of methane emissions is equal to 21 tons of CO2e. Some greenhouse gases are significantly more potent than carbon dioxide and are known to persist in the atmosphere for hundreds of years.

Table 1. 2010 Baseline Community Greenhouse Gas Emissions (in millions)

Type of Emission	CO_2 (tons)	N_2O (lbs)	CH_4 (lbs)	Equiv CO_2 (tons)	Bio CO_2 (tons)	Energy (kWh)
Residential	2.81	0.07	1.03	2.83	0.12	7,633.53
Commercial	2.23	0.04	0.34	2.24	0.02	6,410.49
Industrial	3.18	0.18	1.16	3.22	1.51	14,343.77
Transportation	4.32	0.46	0.39	4.39	0.00	16,164.63
Other (Landfills)	-0.25	0.00	180.21	1.64	0.00	---
Total	12.28	0.75	183.14	14.32	1.65	44,552.42

Note: Values represent Scope 1 and Scope 2 emissions. (---) indicates data was not calculated.

Figure 2. Percentage Total CO_2 by Sector



gasoline-powered vehicles. The remaining emissions were from diesel-powered vehicles.

Following the transportation sector, the distribution of CO_2e emissions in the community GHG inventory were as follows: industrial (24%), residential (21%), and commercial (17%). Energy consumption was highest in the industrial sector, followed by the residential and commercial sectors. The primary source of emissions from these sectors was electricity usage followed by natural gas consumption. Regional energy consumption was calculated using data from the U.S. Energy Information Administration, State Energy Data System.

Emissions from active landfills were also included in the inventory. The landfills evaluated included the

Central Arkansas per capita GHG emission rate is much higher than larger places such as Chicago and Portland, but lower than comparable places such as Louisville.

BFI Little Rock Landfill, Little Rock Municipal Landfill, Two Pines Landfill, Faulkner County (City of Conway) Landfill, and Saline County Landfill. Emissions were calculated using data from each county's Solid Waste Management District Annual Report, landfill permits, and landfill gas collection and control system design plans and/or reports. Waste generated within the study area but disposed of outside the community was not included in the inventory. The emissions from active landfills accounted for the least CO_2e

Figure 3. Energy Consumption by Sector

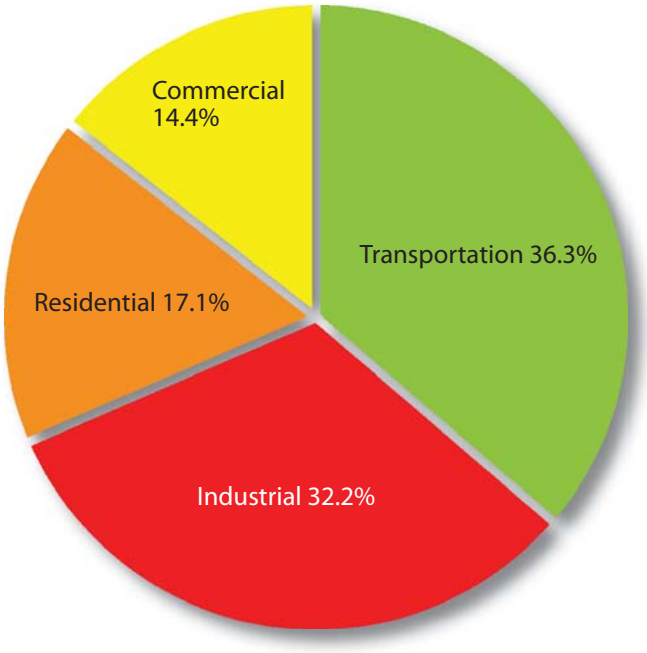


Table 2. 2010 Community Greenhouse Gas Inventory - Transportation Detail (in millions)

Type of Fuel	CO_2 (tons)	N_2O (lbs)	CH_4 (lbs)	Equiv CO_2 (tons)	Bio CO_2 (tons)	Energy (kWh)
Diesel	0.94	0.05	0.006	0.94	0.00	3,365.27
Gasoline	3.55	0.47	0.41	3.62	0.00	13,414.11
Total	4.48	0.48	0.41	4.56	0.00	16,776.39

**HPMS Data provided by Arkansas State Highway Transportation Department*

Table 3. 2010 Community Greenhouse Gas Inventory - Energy Consumption Detail (in millions)

Type of Usage	CO_2 (tons)	N_2O (lbs)	CH_4 (lbs)	Equiv CO_2 (tons)	Bio CO_2 (tons)	Energy (kWh)
Residential Energy Usage						
Electricity	2.22	0.05	0.10	2.23	0.00	4,421.86
Green Electricity*	0.00	0.00	0.00	0.00	0.00	1.59
Natural Gas	0.49	0.002	0.09	0.49	0.00	2,460.34
Propane	0.09	0.003	0.03	0.10	0.00	407.71
Wood	0.00	0.01	0.81	0.01	0.12	342.03
Subtotal Residential	2.81	0.07	1.04	2.83	0.12	7,633.53
Commercial Energy Usage						
Electricity	1.59	0.04	0.07	1.60	0.00	3,168.02
Green Electricity*	0.00	0.00	0.00	0.00	0.00	7.19
Natural Gas	0.62	0.002	0.12	0.62	0.00	3,087.58
Propane	0.02	0.00	0.007	0.02	0.00	85.17
Wood	0.00	0.002	0.15	0.002	0.02	62.53
Subtotal Commercial	2.22	0.04	0.34	2.24	0.02	6,410.49
Industrial Energy Usage						
Electricity	1.94	0.04	0.08	1.94	0.00	3,857.07
Green Electricity*	0.00	0.00	0.00	0.00	0.00	0.00
Natural Gas	1.20	0.004	0.05	1.21	0.00	6,037.40
Propane	0.04	0.001	0.004	0.04	0.00	175.96
Wood	0.00	0.14	1.03	0.03	1.51	4,273.34
Subtotal Industrial	3.18	0.18	1.16	3.22	1.51	14,343.77

**Solar energy usage*

emissions in 2010. A total of 1,641,163 tons of CO_2e was emitted.

Most landfills use a flare system or other combustion device to address safety concerns associated with landfill gases and reduce methane emissions. Two landfills within the study area, however, use captured methane for energy or reuse. The Two Pines Landfill operates a gas conversion plant that supplies electricity to approximately 4,500 homes in North Little Rock. The Little Rock Municipal Landfill sells its collected methane to a chemical company via pipeline for reuse. A portion of overall GHG emissions were mitigated, as shown by negative emissions, from these two landfills.

Comparisons with Other Regions

Based on the 2010 baseline GHG emission results calculated using the ICLEI CACP software, central Arkansas has a per capita GHG emission rate of approximately 21.32 tons CO_2e per year. A GHG emission benchmark comparison for central Arkansas has not been conducted. However, a high-level comparison of GHG emission rates from a few com-

THE GHG EMISSIONS INVENTORY PROVIDES A USEFUL BENCHMARK FOR EVALUATING PROGRESS.

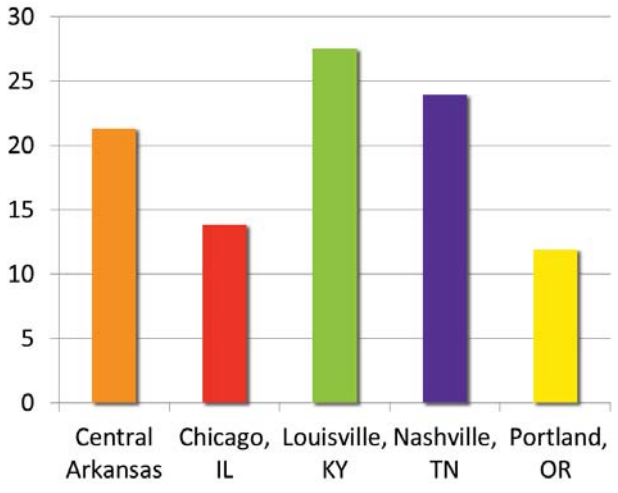
Table 4. 2010 Community Greenhouse Gas Inventory - Landfill Emissions Detail

Type of Landfill Emission	CO_2 (tons)	N_2O (lbs)	CH_4 (lbs)	Equiv CO_2 (tons)	Bio CO_2 (tons)	Energy (kWh)
BFI Little Rock Landfill						
Carbon Dioxide	---	---	---	---	---	---
Methane	0.00	0.00	1.56	0.02	0.00	---
Faulkner County Landfill						
Carbon Dioxide	---	---	---	---	---	---
Methane	0.00	0.00	61.54	0.65	0.00	---
Little Rock Municipal Landfill						
Carbon Dioxide	-0.05	0.00	0.00	-0.05	0.00	---
Methane	0.00	0.00	3.16	0.03	0.00	---
Saline County Landfill						
Carbon Dioxide	---	---	---	---	---	---
Methane	0.00	0.00	108.57	1.14	0.00	---
Two Pines Landfill						
Carbon Dioxide	-0.20	0.00	0.00	-0.02	0.00	---
Methane	0.00	0.00	5.38	0.06	0.00	---
Total Other (Landfills)	**-0.25**	**0.00**	**180.21**	**1.64**	**0.00**	**---**

Note: (---) indicates data is not available or was not calculated.

munities are provided.[2] Central Arkansas' calculated emission rate is relatively higher than emissions calculated from Portland, Oregon at 11.9 and Chicago, Illinois at 13.8 tons CO_2e per year. Conversely, the emission rate per capita from Louisville, Kentucky at 27.34 and Nashville, Tennessee at 23.9 tons of CO_2e per year are greater than central Arkansas' calculated emission rate.

Figure 4. CO_2 Rate Comparison



THE ABILITY FOR CENTRAL ARKANSAS TO MAINTAIN ITSELF AS A REGION IS DIRECTLY LINKED TO TRANSPORTATION CHOICES.

2 A greenhouse gas emission benchmark comparison for Metroplan has not been conducted. Each of the community inventories listed include unique data sets that would be further described and assessed during a complete benchmark comparison. Currently, GHG emission inventories depend on the type and quality of the data available by each community and this is subject to variability between communities. The emissions listed for these other presented communities may include or omit GHG emission sources that are included as part of Metroplan's GHG emission inventory. For example, many community inventories include streetlight data but the baseline GHG emission inventory for Metroplan does not include this information as it was not available at the time of the inventory. A focused benchmark comparison of GHG emissions for communities with similar GHG emission sources to that of Metroplan is suggested to identify and assess how Metroplan compares.

Future Considerations

Metroplan has the opportunity to use the results of the baseline GHG emissions inventory to assist with developing strategies to minimize GHGs from central Arkansas as well as to gauge progress toward meeting near-term and long-term goals. As part of this effort, Metroplan may support regional sustainability planning by evaluating the results of Imagine Central Arkansas and the baseline GHG emissions inventory together with the focus areas, strategies, and proposed actions of the Green Agenda. Preliminary opportunities to cumulatively evaluate these plans have already been identified as presented in the following tables. By collectively accounting for the information presented in these documents, Metroplan will help focus future planning efforts that will responsibly accommodate growth and preserve the region's resources.

Table 5. Nature

	Imagine Central Arkansas	2010 GHG Inventory
Protect Air Quality in Central Arkansas		
Promote Ozone Action Days Program to reduce harmful vehicle emissions and number of ozone alert days.		●
Promote alternative modes of transportation like walking, biking, ride sharing, and transit.	●	●
Improve fuel efficiency of municipal fleets and explore cleaner fuel sources.		●
Promote anti-idling policies for municipal and commercial fleets.		●
Plan for Thriving Communities		
Align local comprehensive development plans with regional transportation, economic development, housing, and other plans that address sustainability.	●	
Promote incentives for infill development and innovative solutions for under utilized urban infrastructure.	●	
Remove impediments in existing codes and procedures to sustainable renovations of existing buildings.	●	
Provide incentives to encourage the use of sustainable building practices for new construction and renovation.	●	
Identify and reduce policy barriers to local farmers markets and local food production.	●	●
Expand regional recycling efforts to serve the larger Central Arkansas region.	●	
Encourage recycling and recycling-based businesses as part of a comprehensive economic development policy.	●	
Research the feasibility of a regional composting initiative.		
Protect Water Sources and Watersheds		
Develop a regional green infrastructure plan that identifies areas to protect as natural in order to preserve watersheds, protect drinking water sources, and guide land development.	●	
Align local development plans with regional green infrastructure plan.	●	
Demonstrate innovative water conservation strategies in buildings, with public facilities leading the way.	●	
Identify and adopt best management practices and water conservation standards for new development.	●	

Table 6. Movement

	Imagine Central Arkansas	2010 GHG Inventory
Improve Bicycling Options		
Promote Bicycle Master Plans in local government and the Regional Strategic Bicycle Network.		
Make safe routes for children a priority, whether walking or riding bikes to schools, parks, recreation facilities, and other destinations.		
Enhance bicycle infrastructure (lanes, paths, routes, and bike racks).		
Enhance personal safety through lighting and street design.		
Make community aware of existing bicycle facilities.		
Improve Walking Options		
Promote Master Pedestrian Plans in local government.		
Enhance pedestrian infrastructure (sidewalks, paths, connections, and street furniture).		
Enhance personal safety through street design and lighting.		
Encourage pedestrian-friendly design of roads and land development through policy		
Improve Transit Options		
Continue to develop the Regional Strategic Transit Network.		
Secure dedicated funding sources		
Focus on supporting transit hubs and development around hubs.		
Plan for spoke transit, i.e. Little Rock to Conway, Benton/Bryant, and Cabot.		
Develop branded bus routes with high frequency as pilot project.		
Make transit schedules easier to read and access.		
Reduce Congestion		
Continue to develop the Regional Arterial Network, which provides alternative routes to the freeway system and facilitates regional travel.		
Analyze regional traffic congestion and recommend congestion mitigation strategies through the Congestion Management Process.		
Coordinate traffic signals to reduce stop and starts in traffic.		
Promote carpooling; flex work schedule, and telecommuting to reduce rush hour congestion and the number of vehicles on the roads.		
Encourage mixed use and mixed income development to reduce the need for driving and provide options like public transit, walking, and bicycle use.		
Implement a street design program that responds to urban contexts and the role of streets as public spaces and multiple modes. Incorporate green streets, featuring sustainable landscaping standards, streetscape elements, and effective storm water management practices, into this program.		
Improve multimodal connections and choices so that transit connects with bicycle/pedestrian pathways and destinations.		

Table 7. Knowledge

	Imagine Central Arkansas	2010 GHG Inventory
Increase Public Awareness of Benefits		
Identify easy steps to take for governments, businesses, and individuals to support the Green Agenda.		
Work with vehicle maintenance providers to educate consumers about the potential savings and impact on fuel consumption of maintaining vehicles properly and practicing fuel–efficient driving techniques.		
Develop community-wide demonstration projects and educational efforts that increase awareness of the value of existing buildings among building owners, designers and users.		
Provide Educational Resources		
Support a public information campaign to build and sustain support and participation in recycling programs.		
Increase communication between local governments and state-wide initiatives and organizations.		
Provide a forum for sharing recycling information throughout region.		
Provide resources for designers, contractors and building officials regarding sustainability design, construction, retrofits, inspection, and code requirements.		
Create a fact sheet for developers and residents with energy efficiency/renewable energy incentive information.		
Facilitate data and information sharing between government agencies.		
Involve residents and stakeholders with public forums and meetings to increase awareness of land use issues.		
Educate staff and citizenry about Green Agenda case studies, incentives, cost benefit analysis, co-benefits.		
Showcase Successful Sustainability Efforts		
Present Green Agenda initiatives of local governments and communities at Metroplan Board meetings (Green Agenda Showcase).		
Identify effective incentives for encouraging implementation of Green Agenda.		

The transportation sector is also the largest consumer of energy, responsible for over 36% of the region's total consumption.

Imagine Central Arkansas represents a significant opportunity to implement the recommendations of the Central Arkansas Green Agenda.

Table 8. Power

	Imagine Central Arkansas	2010 GHG Inventory
Energy Efficiency		
Conduct comprehensive energy evaluations of municipal buildings and recommend modifications.	✓	✓
Develop and adopt energy and resource-efficient building standards for all existing municipal facilities.	✓	✓
Align regional and local energy plans with state and federal energy plans to maximize funding and efficiency.	✓	✓
Update municipal codes to incorporate the latest provisions for energy efficiency and healthy buildings.	✓	✓
Encourage energy efficiency in affordable housing by working with Housing Authorities.	✓	✓
Assist small businesses, community organizations, and public agencies in gaining access to energy efficiency services.		✓
Renewable Energy		
Identify local and feasible renewable energy sources (e.g., methane, hydro, solar, biofuel, etc.).		✓
Evaluate potential energy savings through more efficient use of transportation technology and alternative fuels.		✓
Identify barriers in municipal codes for small scale renewable energy installation and deployment.	✓	
Encourage local energy providers to use renewable energy for a percentage of their total energy production by exploring the development of a regional renewable portfolio standard.		✓

Conclusion

Sustainability, in the broadest sense of the word, is the act of preserving or maintaining a resource so that it is not depleted or permanently damaged. In essence, sustainability means ensuring that the resources we enjoy today, clean air and water, readily available energy sources, quality of life, the ability to move people and goods around the region, are available to future generations. From that standpoint, transportation plays a major role in the sustainability of Central Arkansas.

The transportation sector is the single largest source of man-made carbon dioxide emissions in the region, responsible for almost one-third of all emissions. Carbon dioxide emissions are a major determinant of air quality in central Arkansas. Specifically, ground-level ozone is a significant health concern for the region, prompting "Ozone Action Days," a far-reaching awareness campaign to reduce ozone-related emissions and prevent harmful exposure when levels are at their highest. Transportation-related carbon dioxide emissions are primarily attributed to the operation of motor vehicles, which are at their worst during periods of idling or in stop-and-go conditions.

The transportation sector is also the single largest consumer of energy, accounting for over one-third of all consumption in central Arkansas. Fossil fuels, including coal (and electricity derived from coal), oil and gas, are the primary sources of energy for the region. Fossil fuels are a finite resource.

Clearly, the ability for central Arkansas to maintain itself as a region is directly linked to the transportation choices that we make. Whether it's alternative modes of transportation (walking, cycling and transit), alternative fuel vehicles or the transportation-land use relationship, we must be aware of these relationships and the role they play in central Arkansas' future.

Imagine Central Arkansas represents a significant opportunity to implement the recommendations of the Central Arkansas Green Agenda. This GHG emissions inventory provides a useful benchmark for evaluating progress toward a more sustainable future.