ICLEI Milestone 1

Oshkosh, Wisconsin
Greenhouse Gas Emissions Analysis

Sustainability Advisory Board
May 6, 2013

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Global Climate Change

Global Warming 101

Global warming is a term used to describe a gradual increase in the earth's average ground and atmospheric temperatures across the whole planet. Measurements indicate that the global temperature has increased by about 1 degree Fahrenheit in the past century. This warming trend appeared during a period when human activities were beginning to increase the carbon dioxide (CO2) and other greenhouse gases in the atmosphere.

Although most scientists believe that a rise in carbon dioxide emissions will lead to further global warming, uncertainties remain about the timing and severity of resulting climatic change. Nevertheless, many are convinced that human activities are partly responsible for the long-term warming of the past century and that climatic changes caused by greenhouse gas increases will be a continuing part of our future. Scientists believe that there is enough evidence to warrant a sensible approach toward minimizing the potential consequences of global warming.

The Enhanced Greenhouse Effect

The Earth normally stays at a constant temperature by shedding heat into space at the same rate that it absorbs it from the sun. When the system is unperturbed, the amount of energy given off from the earth equals the amount of energy absorbed. Excessive greenhouse gases upset this balance. The problem that we now face is that human actions, particularly the burning of fossil fuels (coal, oil and natural gas) and land clearing, are increasing the concentrations of these gases, creating the prospect of global climate change. This is the enhanced greenhouse effect.

Human beings increase greenhouse gas levels in the atmosphere through many daily activities. When fossil fuels are burned, the carbon dioxide that has been stored in them for thousands of years is released. Massive burning of fossil fuels in just a few recent decades has emitted tremendous amounts of CO2. Living, growing trees help to absorb carbon dioxide from the atmosphere, so our present trend towards deforestation of the planet means that less carbon dioxide is being absorbed. The two trends – burning more fossil fuels and cutting down more trees – taken together, have increased the concentration of carbon dioxide in the atmosphere.

Humans are responsible for other greenhouse gases as well. Methane is released through intensive agriculture, coal mining, and leaky natural-gas lines. Industrial products emit chlorofluorocarbons (CFCs). Nitrous oxide and low-altitude ozone levels are also increasing rapidly, for reasons that are less clear. Less than 200 years since human beings began making major emissions, greenhouse gas concentrations are raising to levels higher than any yet seen while humans have existed on this planet – and they will rise much further in the years ahead.

Climate Change

Climate is the long-term average of a region's weather events lumped together. Climate change represents a change in these long-term weather patterns. The reason that scientists feel that climate change is a more accurate term than global warming is that the increased levels of greenhouse gases in our atmosphere are causing climatic changes that vary across the planet, both from place to place and season to season.

The Intergovernmental Panel on Climate Change, a panel of 2,000 scientists convened by the United Nations' Environment Program and the World Meteorological Organization, determined that even if steps are taken now to reduce our emissions of greenhouse gases, the globe could warm up at a rate faster than it has in the past 10,000 years. The panel concluded that the temperature rise in the last 150 years suggests a discernable human influence on global climate. If no actions are taken to reduce emissions, computer models of the earth's climate predict that global average temperatures will rise by 1.6-6.3 degrees Fahrenheit over the next 100 years. The rate of climate change is particularly frightening. Since the last ice age the global temperature has risen by 4.5 degrees Celsius. Plants and animals however have had eighteen thousand years to adapt to this change. The rapid changes that are predicted will put great stresses on the natural resources on which cities and all human settlements depend.

Greenhouse Gases from Human Activity

Since the Industrial Revolution in the 1700's, human activities, such as the burning of oil, coal and gas, and deforestation, has increased CO_2 concentrations in the atmosphere. Carbon dioxide is clearly the most important cause of the human-made greenhouse effect. If the present trend continues, the contribution of CO_2 will become considerably higher by the year 2100.

Introduction

The Oshkosh Sustainability Board recognizes that greenhouse gas (GHG) emissions from human activity are contributing to global warming and that Oshkosh must act quickly to understand the amount of emissions being generated within the community. On September 11, 2007, the City Oshkosh signed onto the U.S. Mayor's Climate Protection Agreement committing to reduce GHG emissions to meet or surpass the Kyoto Protocol targets of a seven percent reduction from 1990 levels by 2012 (Resolution 07-262). Additionally, Resolution 08-295, approved August 26, 2008, committed our community to adopting the International Council for Local Environmental Initiatives (ICLEI) five milestones to reduce GHG and air pollution emissions.

ICLEI Milestones

Milestone 1 **– Conduct a Greenhouse Gas Emissions Analysis: Baseline Inventory and Forecast of Emissions Growth**

The GHG Emissions Inventory and Analysis is an audit of the activities causing or releasing GHG, and a projection of how much these activities are likely to grow by a target year. The full analysis consists of a baseline inventory and a target year forecast of GHG emissions for community wide sources and a baseline inventory and forecast completed just for local government facilities and operations. Knowing where the bulk of emissions are coming from – whether it is vehicles, streetlights, commercial electricity use, residential heating, or land filled waste – allows the targeting of projects and programs to reduce emissions effectively.

Milestone 2 **– Set a Reduction Target**

The reduction target is the specific GHG emissions reduction goal that the city of Oshkosh aims to achieve by a designated year. It is usually expressed as a percentage reduction below the quantity of emissions released in the baseline year.

Milestone 3 **– Develop a Climate Action Plan**

This Plan is a description of the actions – policies, programs, and measures– that the city of Oshkosh will take to meet its GHG reduction target.

Milestone 4 – Implement the Climate Action Plan

Milestone 5 – Monitor Progress and Report Results

Milestone 1 – Conduct a Greenhouse Gas Emissions Analysis: Baseline Inventory and Forecast of Emissions Growth

A Municipal Operations Baseline Inventory was conducted first by Ashley Hellenbrand and Alicia Werner, interns from the University of Wisconsin-Oshkosh Environmental Studies program. Together they worked with Jon Urben, City of Oshkosh Director of General Services and Paul Greeninger, City of Oshkosh Safety and Risk Management Coordinator to complete the Municipal Operations Inventory in the spring of 2009.

Next, from 2011-2012, a Community-Wide Inventory was conducted Elizabeth Schultz, City of Oshkosh Planning Technician, and Steve Barney, City of Oshkosh Sustainability Advisory Board Member.

Finally, beginning in 2013, a forecast of future emission growth was completed by the Sustainability Advisory Board's Energy and Efficiency Subcommittee (Bob Poeschl, Aaron Campbell, Steve Barney and Michelle Bogden-Muetzel) along with the help of Ashley Kraus, City of Oshkosh Planning Assistant.

Objectives

The Sustainability Advisory Board aimed to achieve the following objectives when conducting the baseline inventories:

- Accuracy – emissions should not overstate or understate actual GHG emissions.
- Completeness – to address all relevant GHG emissions.
- Consistency – to enable meaningful comparison
- Transparency – Activity data, sources, emissions factors and accounting methodologies should be documented and disclosed.

The above objectives are achieved by applying accepted methodologies in designing the inventory and calculating emissions from the best available data.

Methodology and Software

The Community-Wide Emissions Inventory prioritized emissions estimates based on actual activities within the community (e.g. utility bills for electricity and natural gas usage) over modeled data. However, in some cases, the results of modeling are the only options available to base a calculation on (e.g. determining emissions from vehicle transportation requires modeling the number of vehicle miles traveled [VMT]).

Oshkosh's Municipal Operations Emissions Inventory was guided by ICLEI, following a Local Government Operations Protocol (LGOP) developed through a multi-stakeholder process in alignment with international emissions inventory procedures. This national standard provides for the complete, transparent, and accurate reporting of a local government's GHG emissions, and guides participants through emissions calculation methodologies and reporting guidance applicable to all U.S. local governments. The LGOP

addresses greenhouse gas emissions from a range of sources, including facilities, vehicle fleets, power generation facilities, solid waste facilities, and wastewater treatment facilities.

Calculations were produced using ICLEI – Local Governments for Sustainability's Clean Air and Climate Protection (CACP) software. The software generates estimated GHG emissions by taking activity data and multiplying it by emissions factors.

Establishing Boundaries

Setting a boundary for GHG emissions accounting and reporting is an important step in the inventory process. Oshkosh's Community-Wide Emissions Inventory assesses emissions resulting from activities taking place within the city of Oshkosh municipal boundary. The Municipal Operations Emissions Inventory took a look at the following: municipal buildings and facilities, street lights, traffic signals, water delivery facilities, fleet vehicles, transit fleet, and solid waste facilities. Activities that occur within these boundaries can be, for the most part, controlled or influenced by City of Oshkosh policies and community educational programs.

Included Greenhouse Gases

Both inventories include emissions of the following greenhouse gases which make up the majority of Oshkosh's climate change impact:

1. Carbon Dioxide (CO2)
2. Methane (CH4)
3. Nitrous Oxide (N2O)

Units of carbon dioxide equivalent (CO2e) are used to normalize the global warming potential of the various GHGs highlighted above. As portrayed in Figure 1, the emission of 1 ton of N2O has a global warming potential (GWP) 310 times larger than that of the emissions of 1 ton of CO2. Similarly, the emission of 1 ton of CH4 has a GWP 21 times that of CO2. To avoid confusion between emissions of the different types of gases and their respective GWPs, all emissions documented from here on are reduced to the common unit of CO2e, or carbon dioxide equivalent.

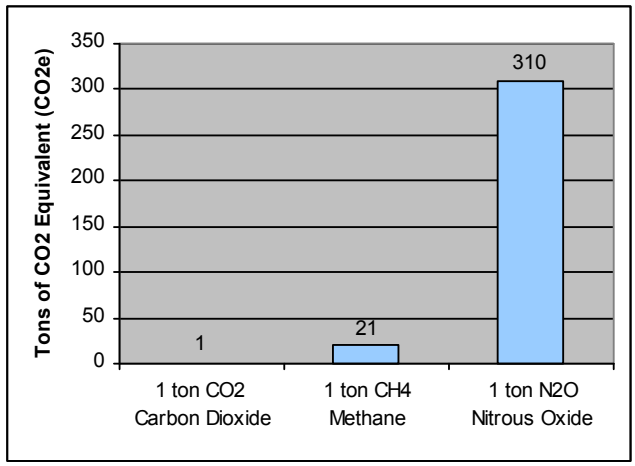

Figure 1: Units of GHG Representation

Greenhouse Gas Emission Sources

ICLEI's CACP software required the inventory of all Direct (Scope 1), Energy Indirect (Scope 2), and Indirect (Scope 3) GHG emissions. Provided below is a breakdown of Oshkosh emission sources:

Direct (Scope 1)	Energy Indirect (Scope 2)	Other Indirect (Scope 3)
• Transportation	• Electricity • Natural Gas	• Waste

Figure 2: Oshkosh Emission Sources

Emission sources not included are upstream energy and process emissions embodied in the goods and services that enter Oshkosh from outside of the municipal boundary. For example, the emissions generated to produce a bottle of water (e.g. extracting raw material, processing, machining, and transporting to Oshkosh) are not included in this inventory.

How does the city of Oshkosh compare against other communities?

The kinds of services provided by local governments vary greatly. Some operate schools, water treatment facilities, ports, airports, transit systems, public housing, and municipal utilities, while others might operate only some or none of those. Additionally, local government emissions are influenced by factors outside of local control, including sources of electricity generation in the region and weather. Because of this complex mix of factors it is very difficult to make useful comparisons between the emissions of different local governments. It is more useful to look at the greenhouse gas inventory as a way to help local governments understand the sources of greenhouse gas emissions from their operations, and to provide a baseline against which to measure the impact of actions to reduce emissions. Having conducted an inventory and committed to reducing emissions makes Oshkosh a leader in the state and region and well ahead of federal action on climate change.

What is ICLEI and what was their role in the inventory?

ICLEI is a membership association of local governments committed to advancing climate protection and sustainable development. Since its inception in 1990, ICLEI has grown to include over 1,000 local governments throughout the world, more than 550 of which are in the United States. ICLEI's mission is to build, serve, and drive a movement of local governments to advance deep reductions in greenhouse gas emissions and achieve tangible improvements in local sustainability. ICLEI has provided technical assistance and guidance on the completion of this inventory in alignment with the LGOP, and will continue to provide assistance throughout the five-milestone process.

Oshkosh Community-Wide Greenhouse Gas Emissions Inventory

Presented here are estimates of greenhouse gas emissions resulting from community-wide activities in the city of Oshkosh. The year 2007 was chosen as the base year because the data was relatively accessible and easy to collect for that year. This data will provide a baseline against which the City of Oshkosh will be able to compare future performance and demonstrate progress in reducing emissions.

Summary of Findings

The total estimated emissions identified by Oshkosh's Community-Wide Inventory in 2007 were 1,280,222 metric tons of CO2e. Energy consumption was the primary sources of GHG emissions within the community, with electricity and natural gas making up just over 73% of the total emissions. Emissions associated with transportation accounted for less than 27%, while waste disposal by Oshkosh residents contributed less than 1%. When looking at the emissions totals from 2006 – 2010, it is clear that emissions will continue to increase if no action is taken. These sources are presented below in Figure 3 and a detailed report of all emissions can be found in Appendix A.

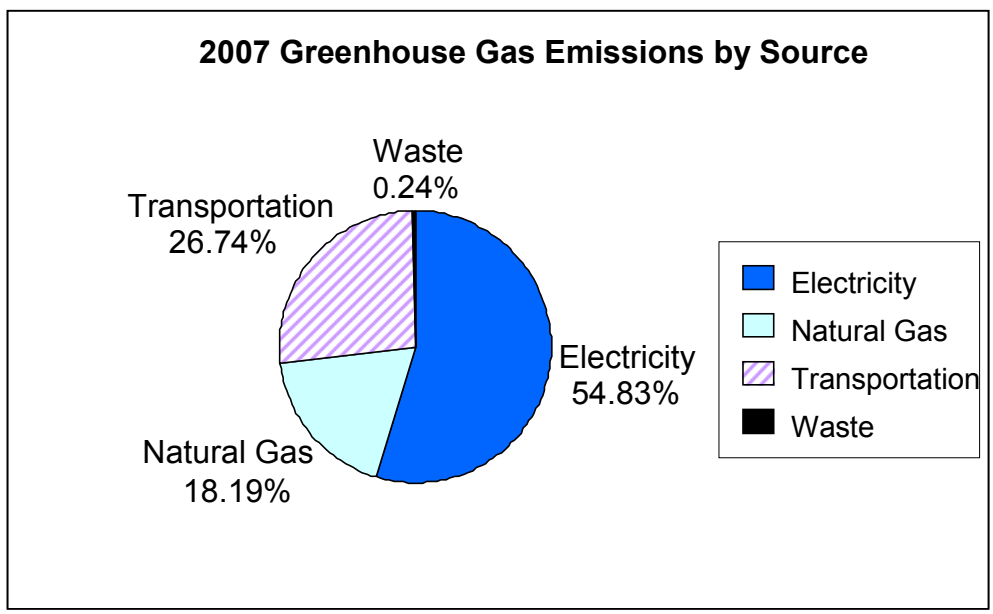

Figure 3: 2007 Oshkosh Community-wide Emissions by Source

Below is a breakdown of community-wide emissions by Sector.

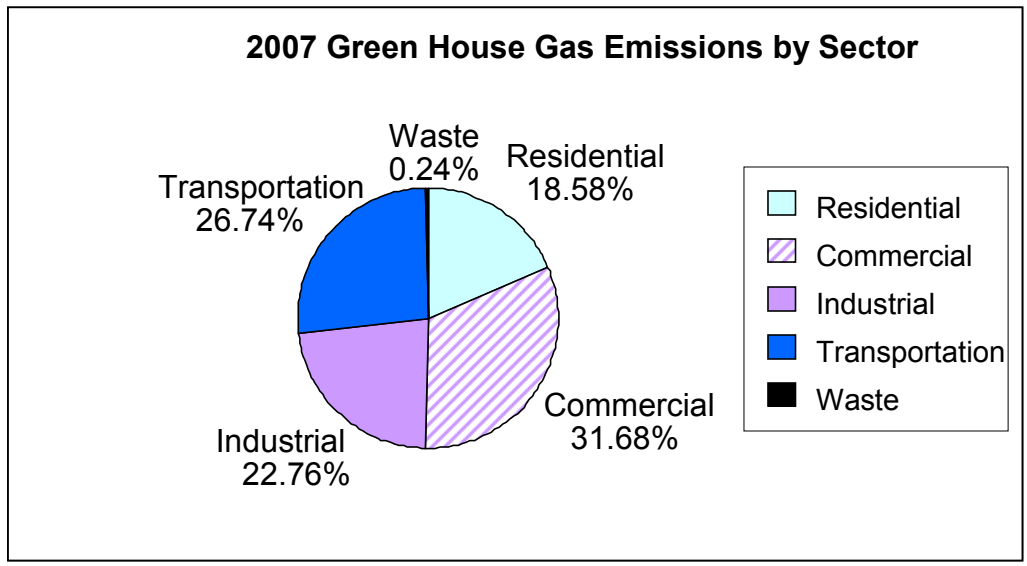

Figure 4: 2007 Oshkosh Community-wide Emissions by Sector

The following sections describe the sources of these GHG emissions broken down by sector and the data and methods used to quantify their impact:

Residential Emissions

Oshkosh's Residential Sector generated an estimated 237,903 metric tons of CO_2e in 2007. Of the total, 65% of emissions or 154,416 metric tons of CO2e were generated through the consumption of electricity. This estimate was calculated using 2007 electricity and natural gas sales data provided by Wisconsin Public Service. Data on residential equipment usage such as lawnmowers or on-site electricity generation is not included in this inventory. GHG emissions associated with residential transportation and residential waste generation are included separately in the Transportation and Waste Sector emissions totals.

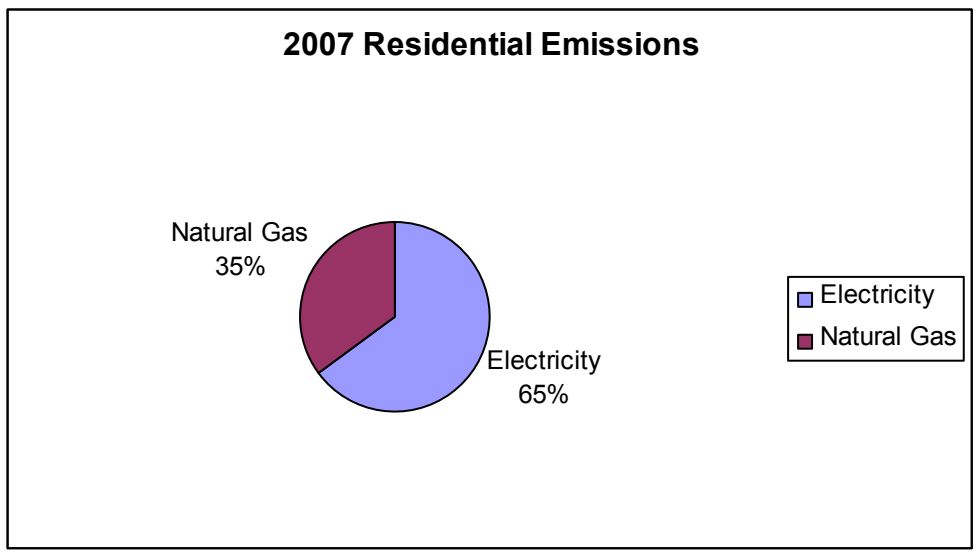

Figure 5: 2007 Oshkosh Residential Sector Emissions by Source

Below is a breakdown of the various greenhouse gases addressed within this inventory.

2007 Residential Emission Sources				
	CO2 (tonnes)	N2O (kg)	CH4 (kg)	Equiv CO2 (tonnes)
Electricity	153,579	2,541	2,309	154,416
Natural Gas	83,274	157	7,853	83,488

Figure 6: 2007 Oshkosh Residential Sector Emissions Breakdown

Commercial Emissions

Oshkosh's Commercial Sector generated 31.68% of community-wide GHG emissions in 2007, or 405,585 metric tons of CO_2e. Of this total 80% of emissions or 325,129 metric tons of CO_2e were created through electricity consumption. This estimate was calculated using 2007 electricity and natural gas sales data provided by Wisconsin Public Service. Please note that the Commercial Sector includes usage data for all schools within Oshkosh and any residential home with three or more meters. Like the Residential data, data on commercial equipment usage, such as lawnmowers or on-site electricity generation, is not included in this inventory.

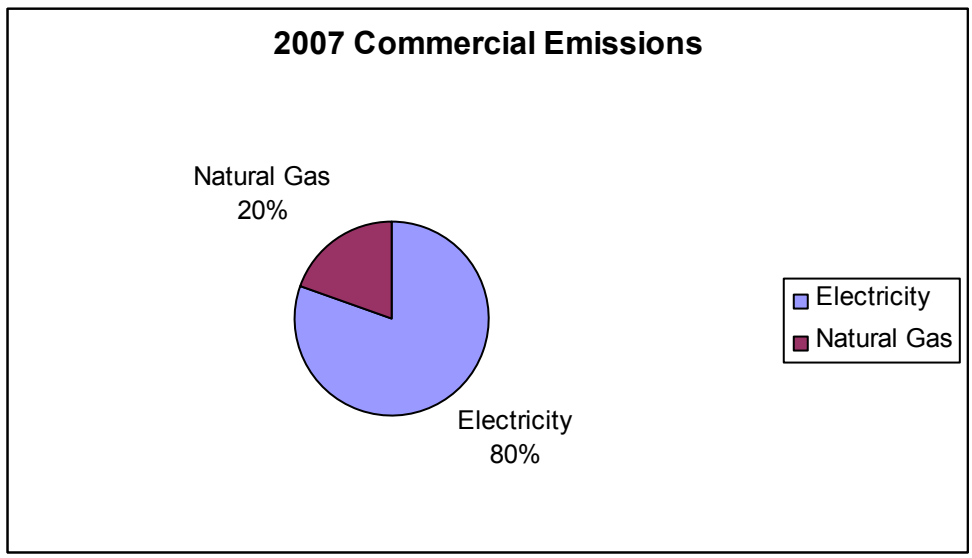

Figure 7: 2007 Oshkosh Commercial Sector Emissions by Source

Below is a breakdown of the various greenhouse gases addressed within this inventory.

2007 Commercial Emission Sources				
	CO2 (tonnes)	N2O (kg)	CH4 (kg)	Equiv CO2 (tonnes)
Electricity	323,368	5,351	4,863	325,129
Natural Gas	80,250	151	7,568	80,456

Figure 8: 2007 Oshkosh Commercial Sector Emissions Breakdown

Industrial Emissions

Oshkosh's industrial sector generated 22.76% of community-wide GHG emissions in 2007, or 291,364 metric tons of CO_2e. Of this total, 76% of emissions, or 222,397 metric tons of CO_2e, were generated through the use of electricity within the industrial sector. This estimate was calculated using 2007 electricity and natural gas sales data provided by Wisconsin Public Service. Like the Residential and Commercial data, data on industrial equipment usage, such as lawnmowers or on-site electricity generation, is not included in this inventory.

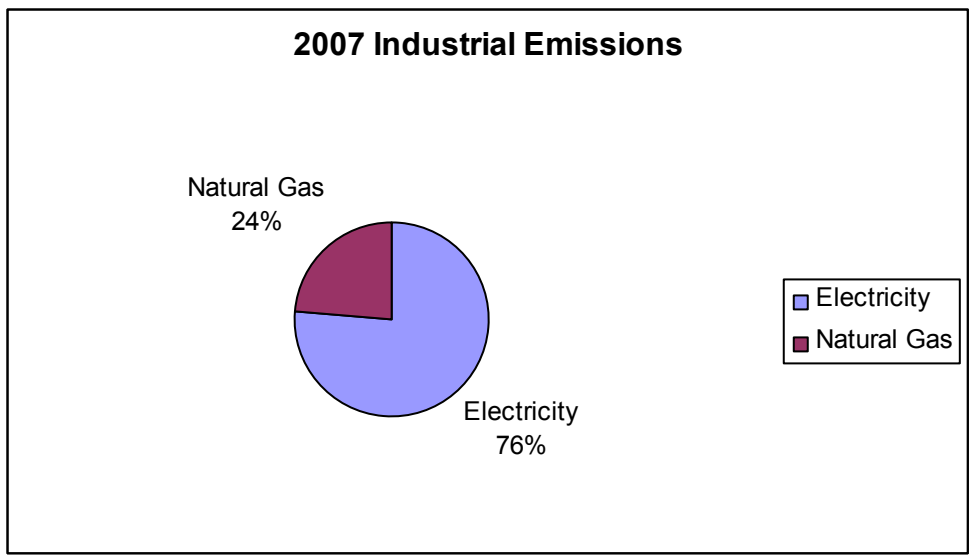

Figure 9: 2007 Oshkosh Industrial Sector Emissions by Source

Below is a breakdown of the various greenhouse gases addressed within this inventory.

2007 Industrial Emission Sources				
	CO2 (tonnes)	N2O (kg)	CH4 (kg)	Equiv CO2 (tonnes)
Electricity	221,192	3,660	3,326	222,397
Natural Gas	68,900	130	1,300	68,968

Figure 10: 2007 Oshkosh Industrial Sector Emissions Breakdown

Transportation Emissions

Oshkosh's transportation sector accounted for 342,275 metric tons of CO_2e, or 26.74% percent of the 2007 community-wide GHG emissions. Of this total, 84% of emissions or 286,280 metric tons of CO_2e were generated by the use of gasoline powered vehicles. The software asks for the number of miles that make up U.S. highways, collecting highways, and local roads, which was obtained from the City of Oshkosh Transportation Department. Mile data was then entered into the software's VMT calculator to obtain VMT estimates for Oshkosh.

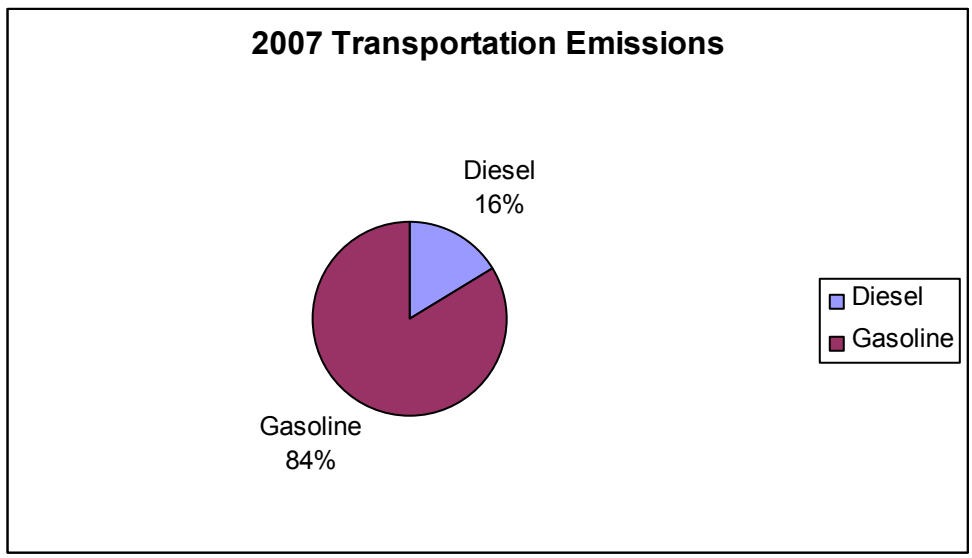

Figure 11: 2007 Oshkosh Transportation Sector Emissions by Source

Below is a breakdown of the various greenhouse gases addressed within this inventory.

2007 Transportation Emission Sources				
	CO2 (tonnes)	N2O (kg)	CH4 (kg)	Equiv CO2 (tonnes)
Diesel	55,942	162	167	55,996
Gasoline	280,255	18,377	15,602	286,280

Figure 12: 2007 Oshkosh Transportation Sector Emissions Breakdown

Waste Emissions

Oshkosh's Waste Sector accounted for 3,095 metric tons of CO_2e, or 0.24% of the total 2007 emissions generated community-wide. It is important to note that the Winnebago County Landfill collects municipal waste from a three county region, however, the above total emissions estimate is what Oshkosh alone contributed. If you were to look at the landfill as a whole, total emissions generated would be 170,347 metric tons of CO2e, making Oshkosh's portion about 1.82% of total emissions generated by the landfill.

Oshkosh's waste tonnage total was obtained directly from the Winnebago County Landfill. The CACP software asks for the data broken down based on the type of waste or the waste share percentage. These percentages were obtained using the 2009 Wisconsin State-wide Waste Characterization Study, which was a comprehensive look at all waste entering various landfills throughout the state. Below are the waste share percentages used to generate 2007 Waste Emissions. Please note that all other waste includes almost 50% of the waste entering landfills but does not account for any GHG emissions:

Waste Share Percentages

Paper Products- 19.6%
Food Waste- 10.6%
Plant Debris- 4.2%
Wood and Textile- 16.1%
All Other Waste- 49.5%

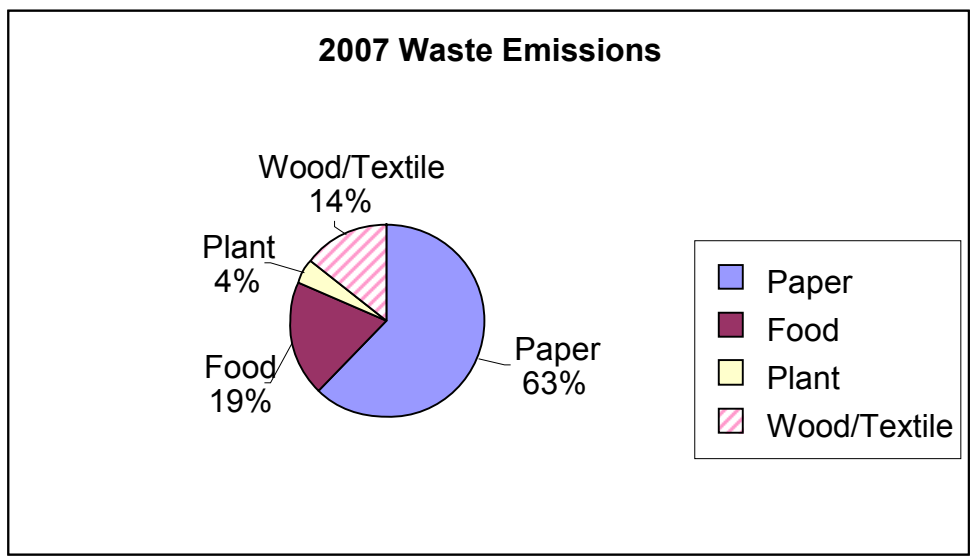

Figure 13: 2007 Oshkosh Waste Sector Emissions by Source

Below is a breakdown of the various greenhouse gases addressed within this inventory.

2007 Waste Emission Sources				
	CO2 (tonnes)	N2O (kg)	CH4 (kg)	Equiv CO2 (tonnes)
Paper	0	0	91,678	1,925
Food	0	0	28,065	589
Plant	0	0	6,301	132
Wood/Textile	0	0	21,313	448

Figure 14: 2007 Oshkosh Waste Sector Emissions Breakdown

Oshkosh Municipal Operations Greenhouse Gas Emissions Inventory

Data collection for the City of Oshkosh Municipal Operations Greenhouse Gas Emissions Inventory took place in the spring of 2009. The base year for the data collection was 2007. The interim year for the inventory was 2008. The interim year data collection is performed to show what progress the City has made with pre-existing measures, and to document trends in energy usage. However, as the base year was relatively recent, there is not much difference between the data from 2007 and 2008.

Oshkosh has collected data for 2006, 2007 and 2008. The data for the three years was quite similar because no significant changes have been made in the City. For simplicity the data for the year 2007 is included in this report exclusively.

Summary of Findings

The results of the inventory indicate that Wastewater facilities (53%), followed by City Buildings (15.8%), Streetlights and Traffic Signals (11.2%), and Water Delivery Facilities (10.9%) represent the greatest sources of greenhouse gas emissions. These results call for energy efficiency initiatives within the City that will reduce emissions, save money, and set an example for energy conservation for the community as a whole.

This preliminary analysis of the inventory results demonstrates the usefulness of the inventory as a tool that should be used to highlight the areas within the City that are making the greatest contribution to greenhouse gas emissions.

This graph represents the percentage of tons C02 equivalent broken down by each source.

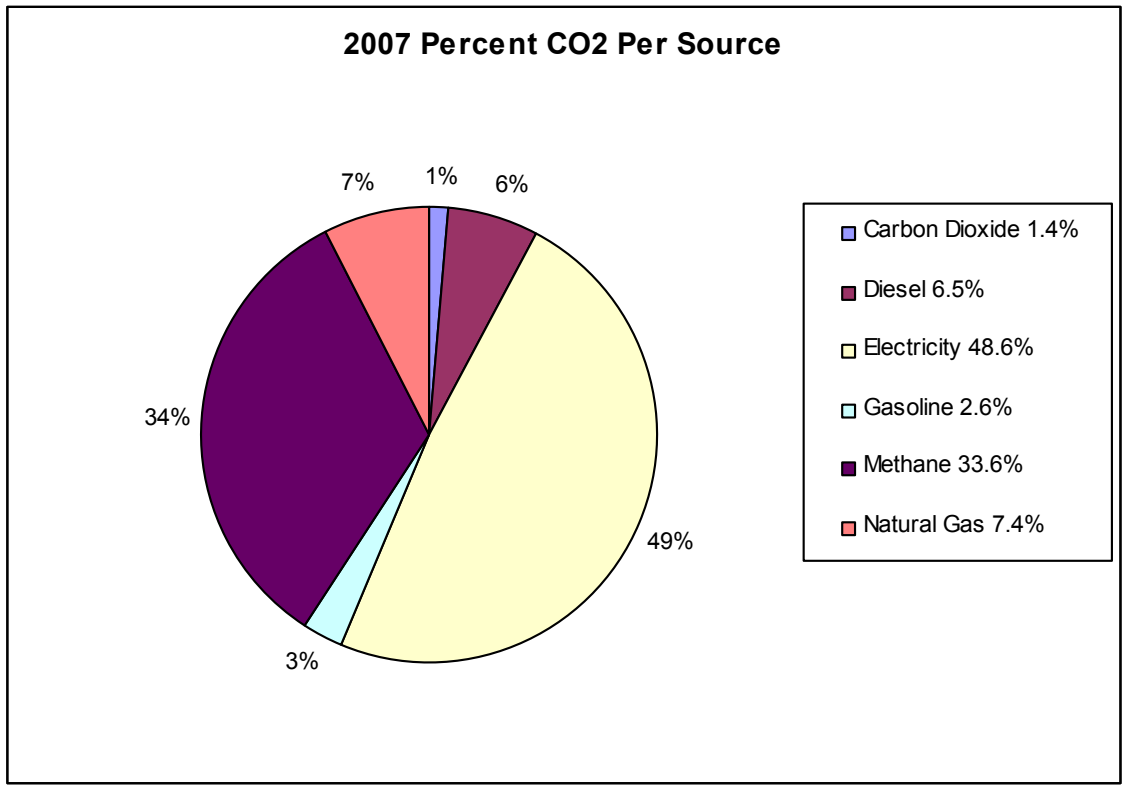

Figure 15: Oshkosh Municipal Operations Emissions by Source

The following graph is a breakdown of the emission sources for each sector given by the CACP Software.

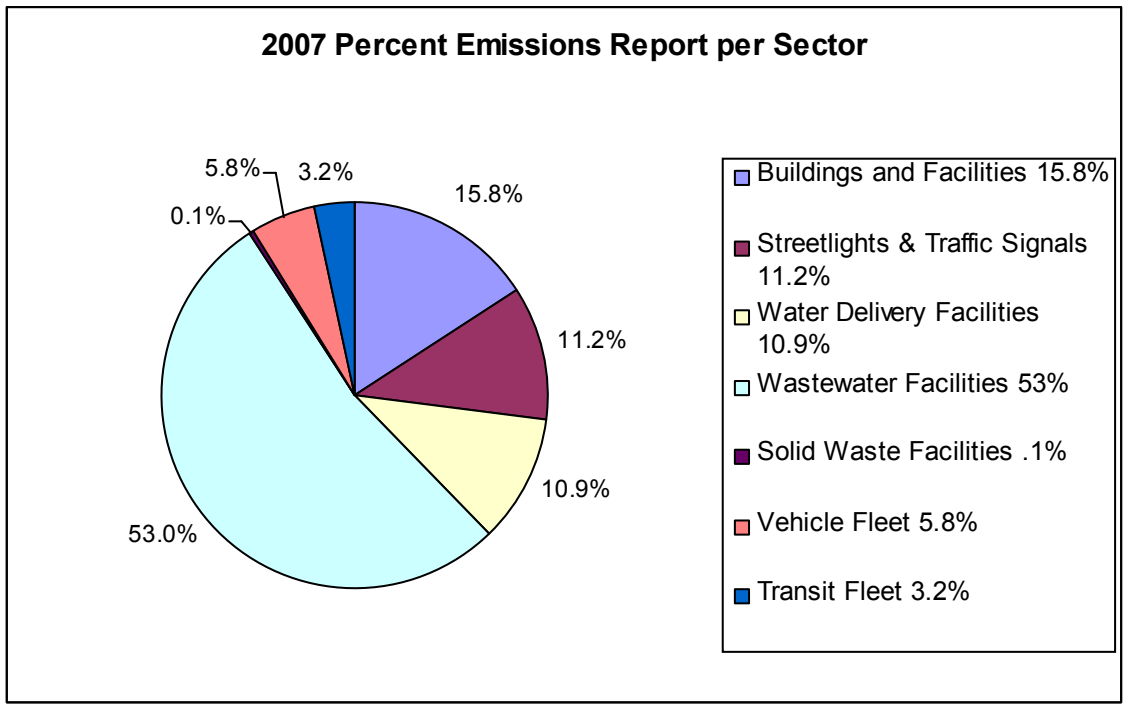

Figure 16: Oshkosh Municipal Operations Emissions by Sector

The following graphs will be a breakdown for each sector by the amount of Tons C02 equivalent released.

Buildings and Facilities Emissions

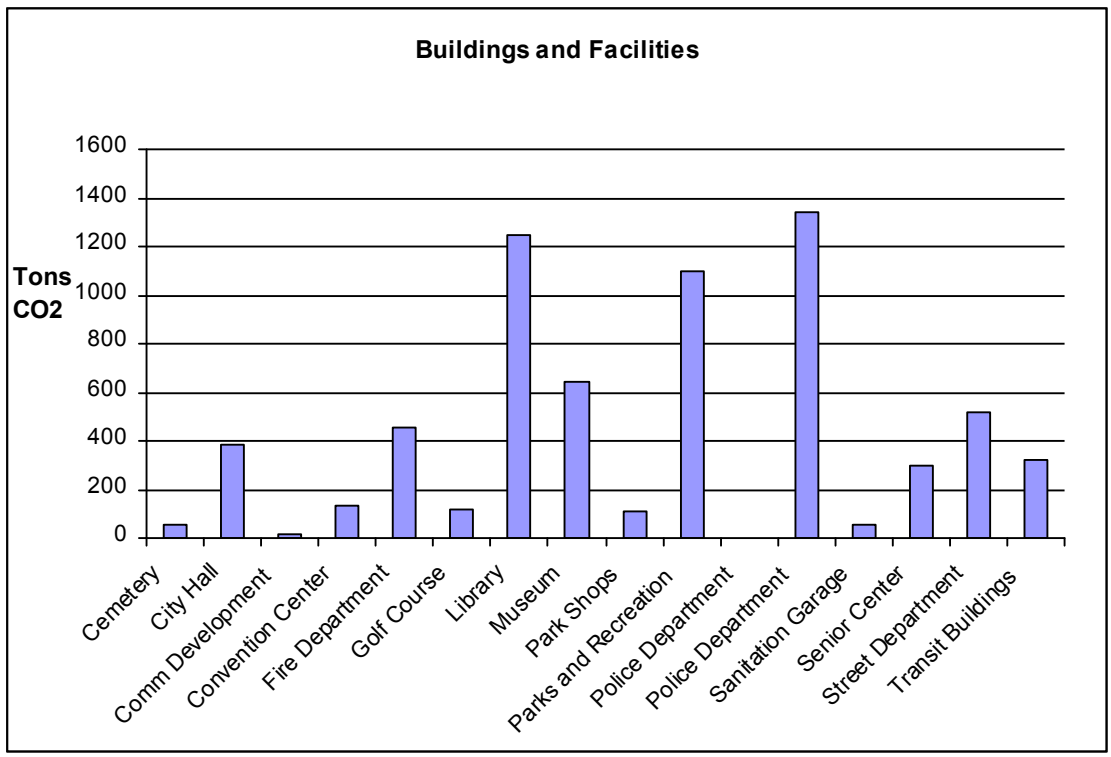

Figure 17: Oshkosh Municipal Operations Buildings and Facilities Emissions

NOTE: All buildings and facilities, streetlights and traffic signals, water delivery facilities, and wastewater facilities information from 2006 - 2008 was received from WPS (Wisconsin Public Service). It should be noted that WPS was contacted on April 22, 2009, to verify that KW data was included in the KWH totals. WPS also indicated to the City that data for the Convention Center was under a separate name, other than the City of Oshkosh, for 2006 and 2007, so complete data is not available for those two years.

Wisconsin Public Service (WPS) data was provided by Scott Hansen. Dan Kussmann, Electrical Traffic Division Supervisor for the City of Oshkosh helped sort out all the meter information. This data can be found in **Appendix C**.

Streetlights and Traffic Signals Emissions

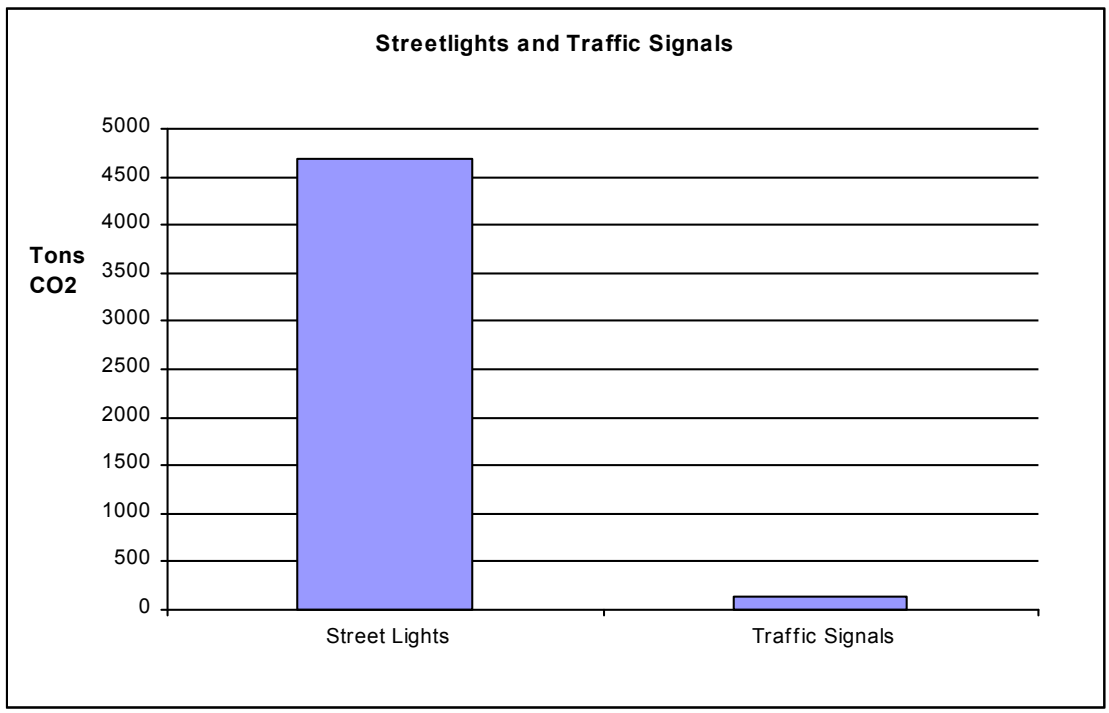

Figure 18: Oshkosh Municipal Operations Streetlights & Traffic Signals Emissions

NOTE: There were two sources of data for streetlights. Some streetlights are metered (**Appendix C**), so that data was included in a report from WPS. For the rest of the streetlights, they are not metered, but rather the City is billed on a monthly rate, and KW usage depends on the type of light fixture. A separate report (**Appendix D**) is included in this report. Those two figures were added together to get complete data.

Water Delivery Facilities Emissions

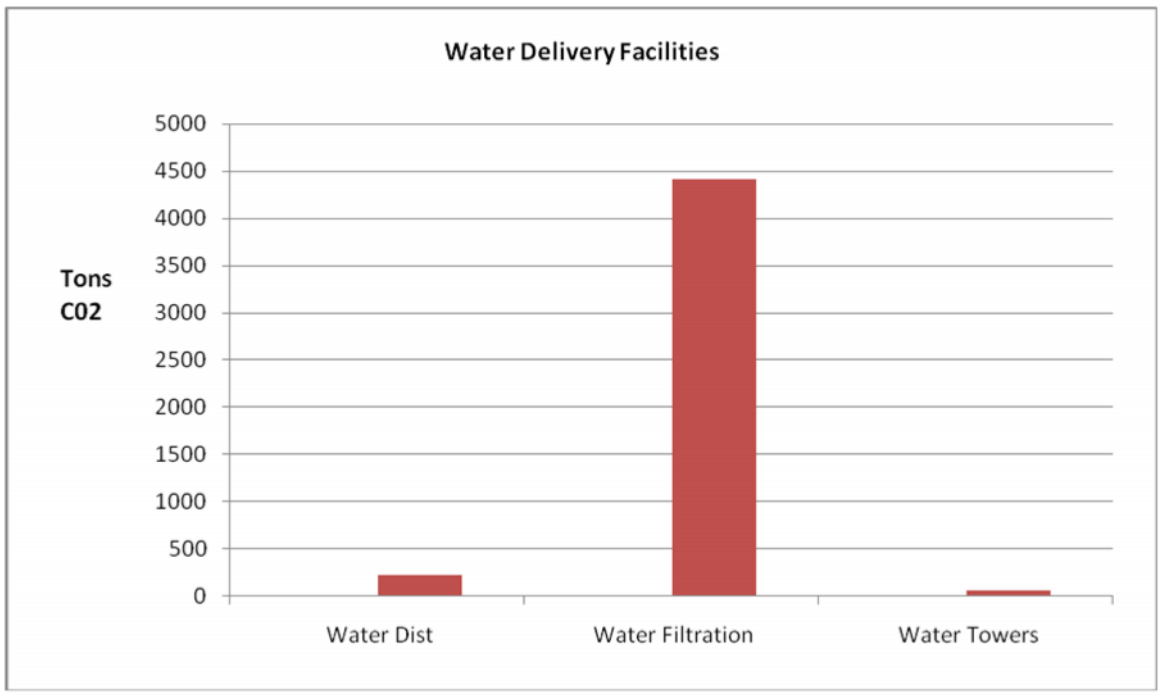

Figure 19: Oshkosh Municipal Operations Water Delivery Facilities Emissions

Wastewater Facilities Emissions

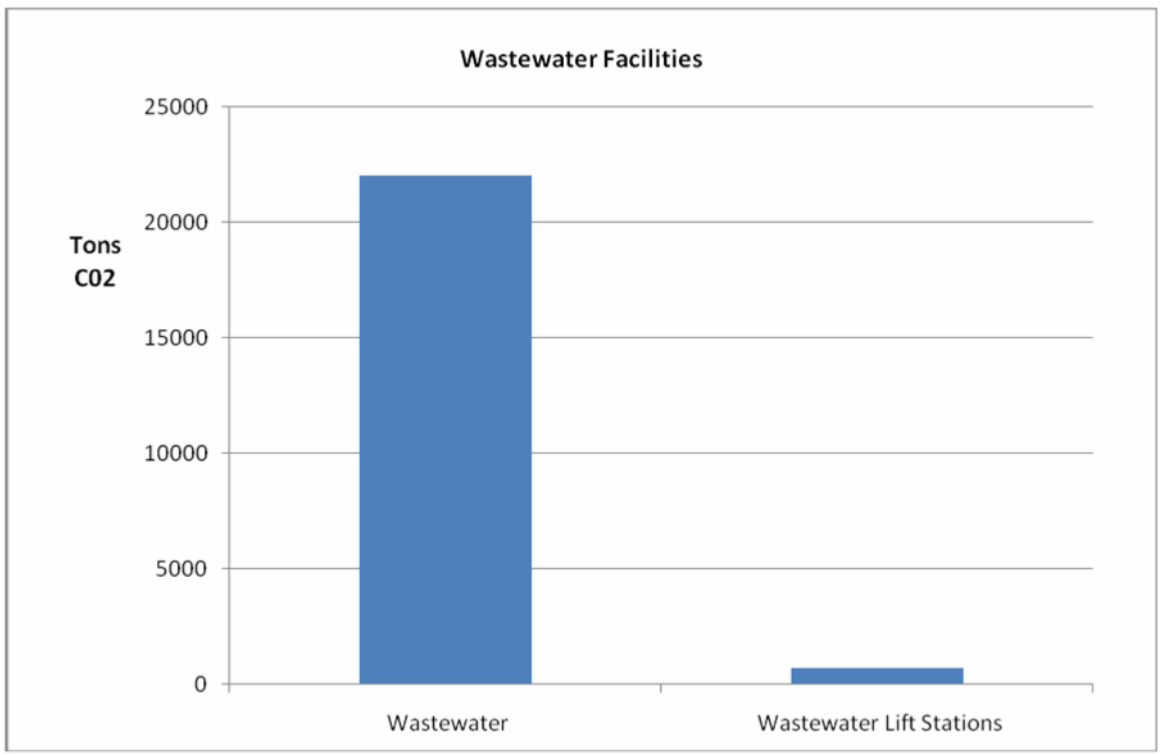

Figure 20: Oshkosh Municipal Operations Wastewater Facilities Emissions

NOTE: Kevin Sorge, Waste Water Treatment Plant Superintendent, provided us with Methane information in SCFM's (Standard Cubic Feet per Minute) produced. This data was unable to be put into the ICLEI software because of improper units. However, Strand Associates, Inc., an engineering firm, was able to calculate the tons of Methane and Carbon Dioxide the Waste Water Treatment Plant produced in 2008. The amounts for 2006 and 2007 were then calculated as a percentage of 2008. The engineer's calculations and calculations for 2006 and 2007 can be found in **Appendix B**.

Solid Waste Emissions

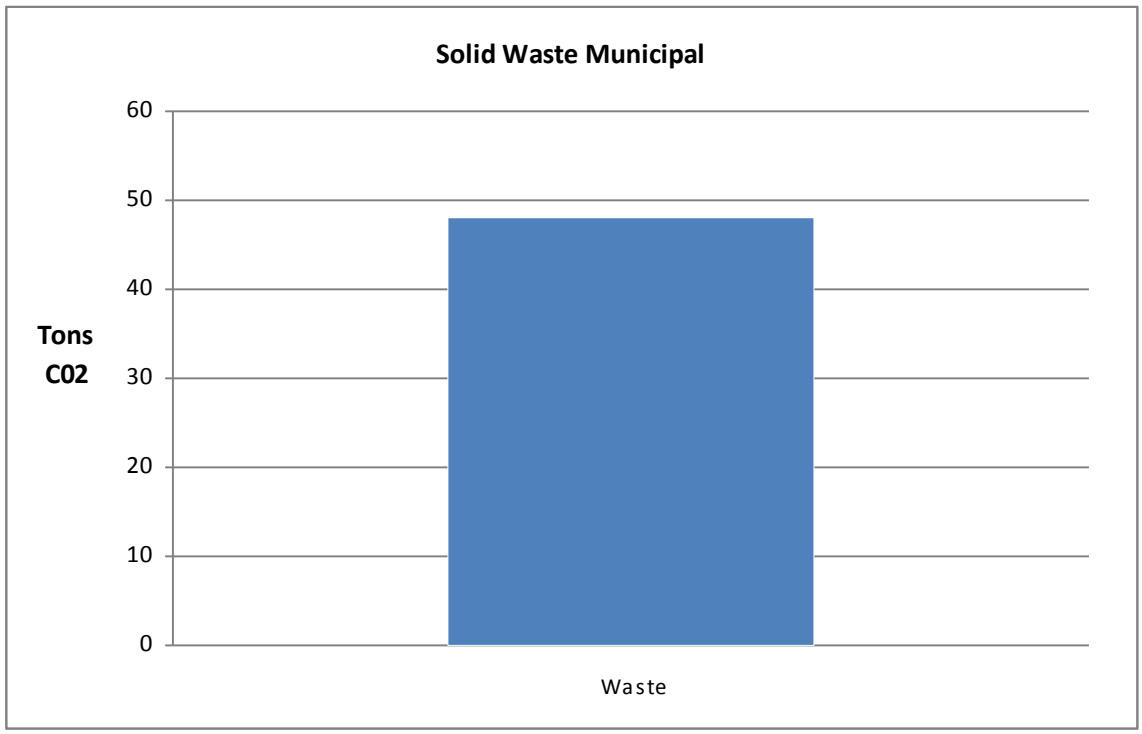

Figure 21: Oshkosh Municipal Operations Solid Waste Emissions

NOTE: The week of April 27, 2009, was taken as a sample for the rest of the year. The sanitation crew gathered the waste from the municipal buildings for one week and recorded the tonnage. That weekly total was then annualized, and used for all three years of data. Data was provided by Jim Hintz, the Sanitation Supervisor for the City of Oshkosh.

John Rabe, Solid Waste Director from the Winnebago County Landfill was contacted regarding data on the landfill waste percentages. He informed us that they did not have that information, since a survey was never done for this landfill. He did supply us with a link to the WDNR website that provided the most recent statewide waste composition study conducted by Franklin Associates, Ltd., initially done in 2002 and updated in June 2003. The results of this study, along with a column used to calculate Oshkosh's percentages, can be found in **Appendix A**. The amount of CO2 produced was calculated by entering in the calculated percentages in to the community side of the ICLEI software.

Vehicle Fleet Emissions

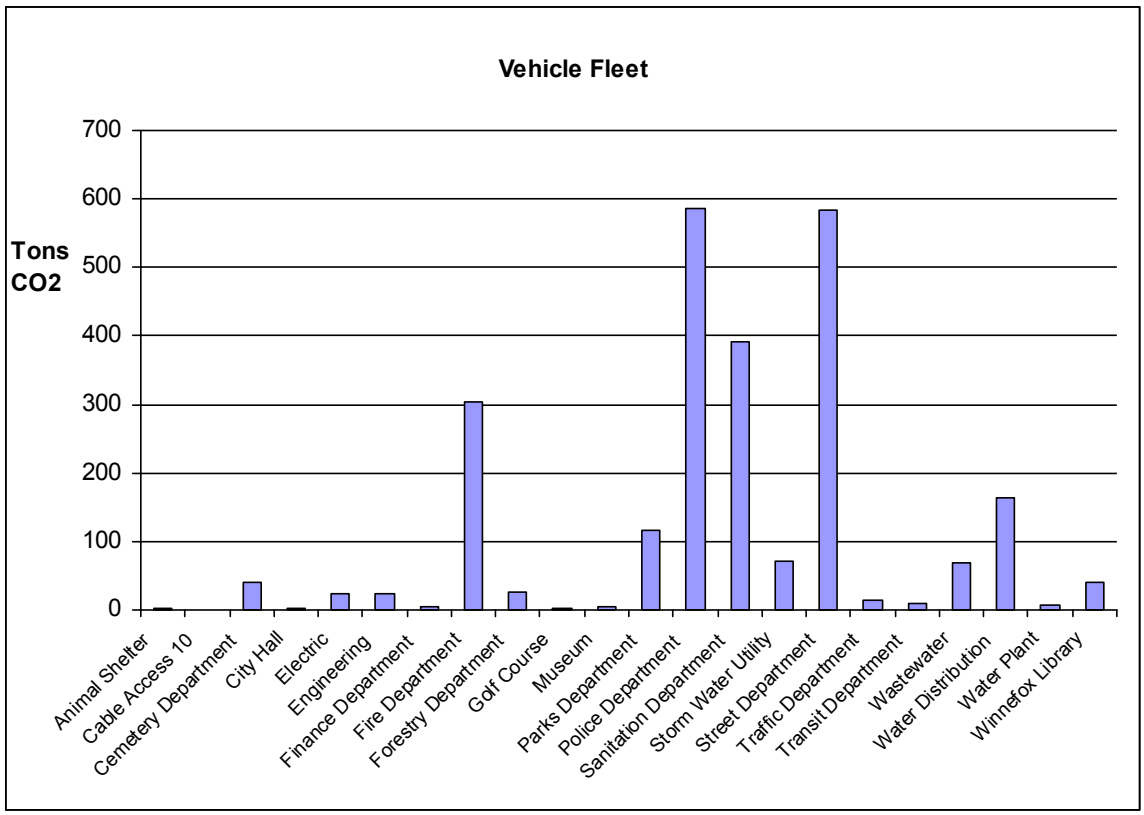

Figure 22: Oshkosh Municipal Operations Vehicle Fleet Emissions

Transit Fleet Emissions

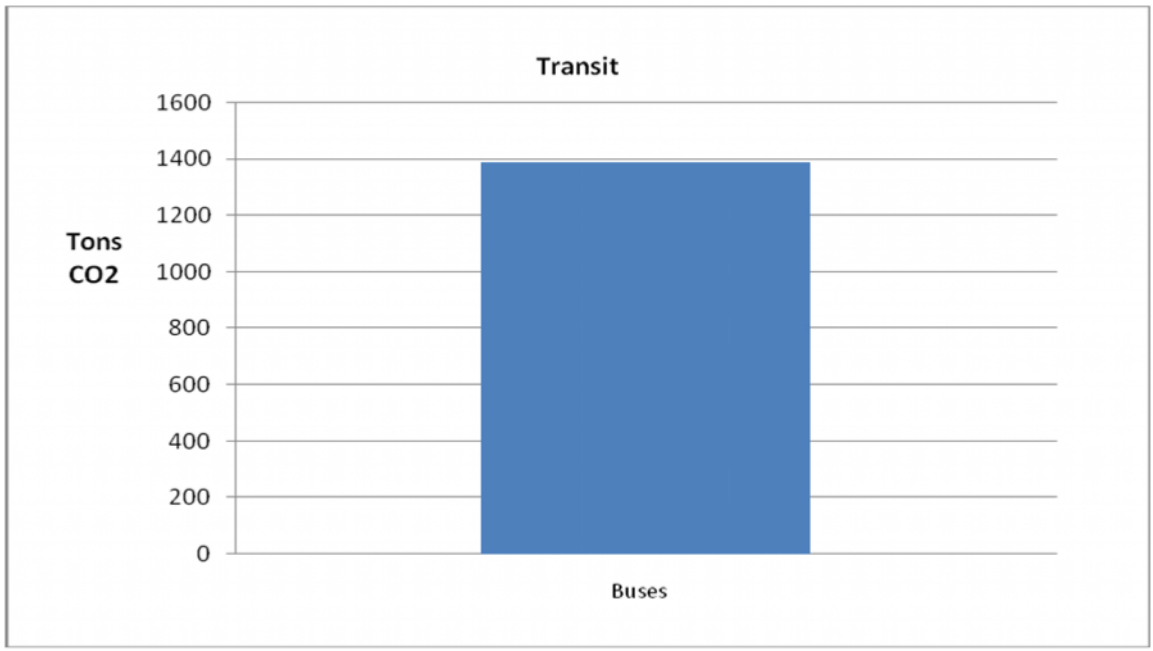

Figure 23: Oshkosh Municipal Operations Transit Fleet Emissions

NOTE: With the exception of Transit Fleet Data, all Vehicle Fleet totals were provided by Bob Knaup, Central Garage Supervisor. Transit (Buses) data was provided by Greg Maxwell, Transit Maintenance Supervisor. The data can be found in **Appendix E**.

Current Trends

Community-Wide Greenhouse Gas Emissions

Taking a look at the change in emissions over time, Oshkosh has experienced, for the most part, a slight decrease in emissions. Between 2008 and 2009, Oshkosh saw a 38,898 metric ton decline in CO2e which equates to a 3% drop in emissions. Based on the data, the decline can be attributed to the Residential and Commercial Sector energy consumption. This decline in consumption is likely due to the recession and consumers being more proactive and aware of their energy usage in an attempt to save money where ever possible.

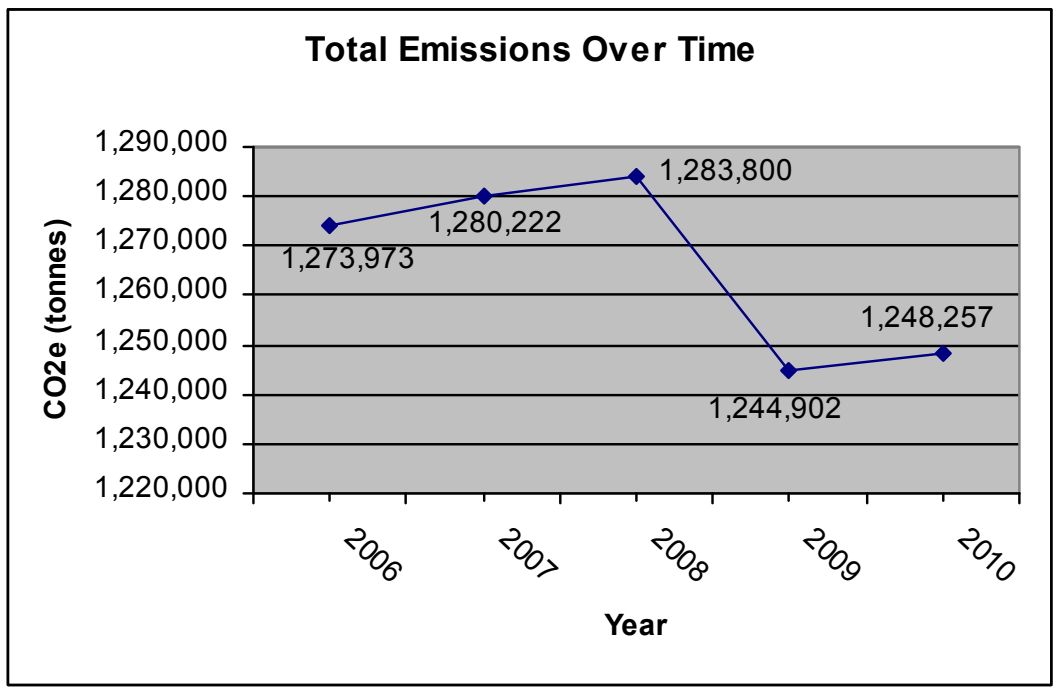

Figure 24: Oshkosh Emissions over Time

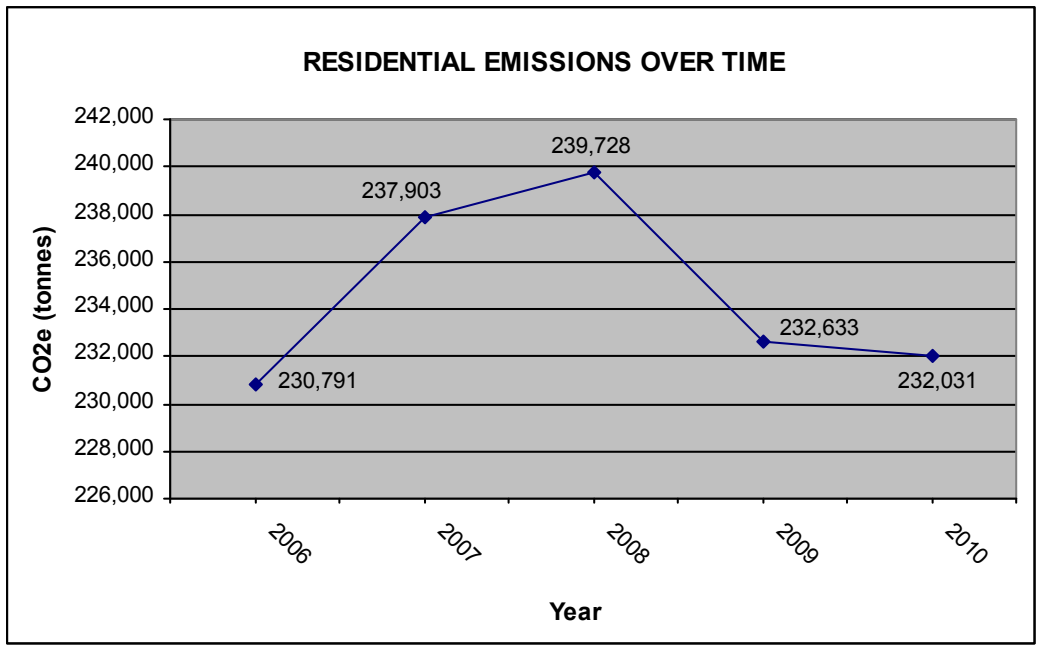

Figure 25: Oshkosh Residential Emissions over Time

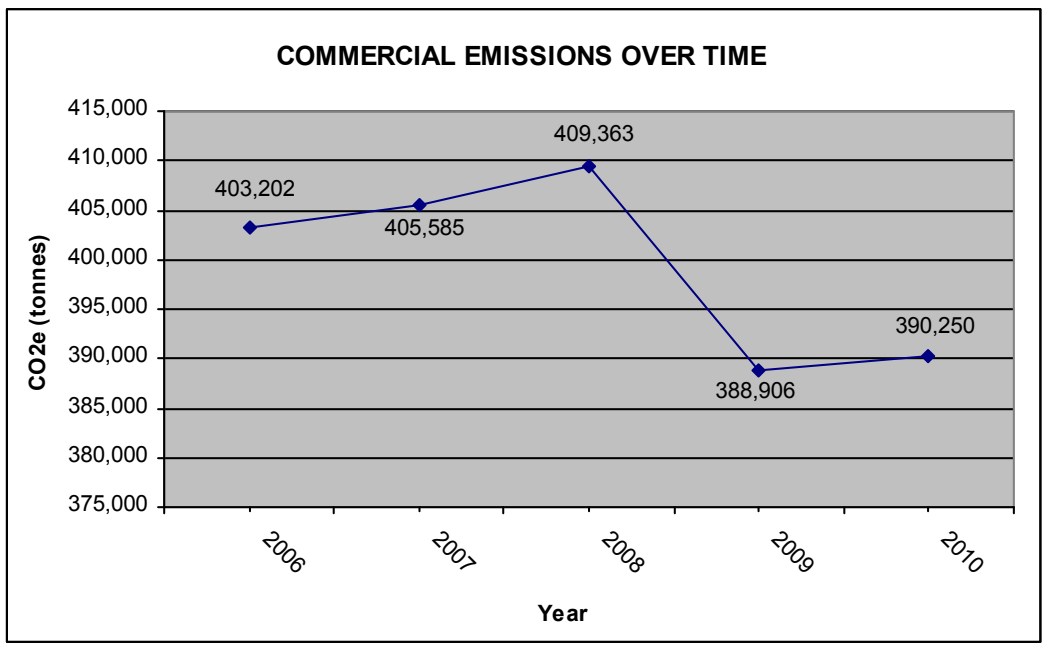

Figure 26: Oshkosh Commercial Emissions over Time

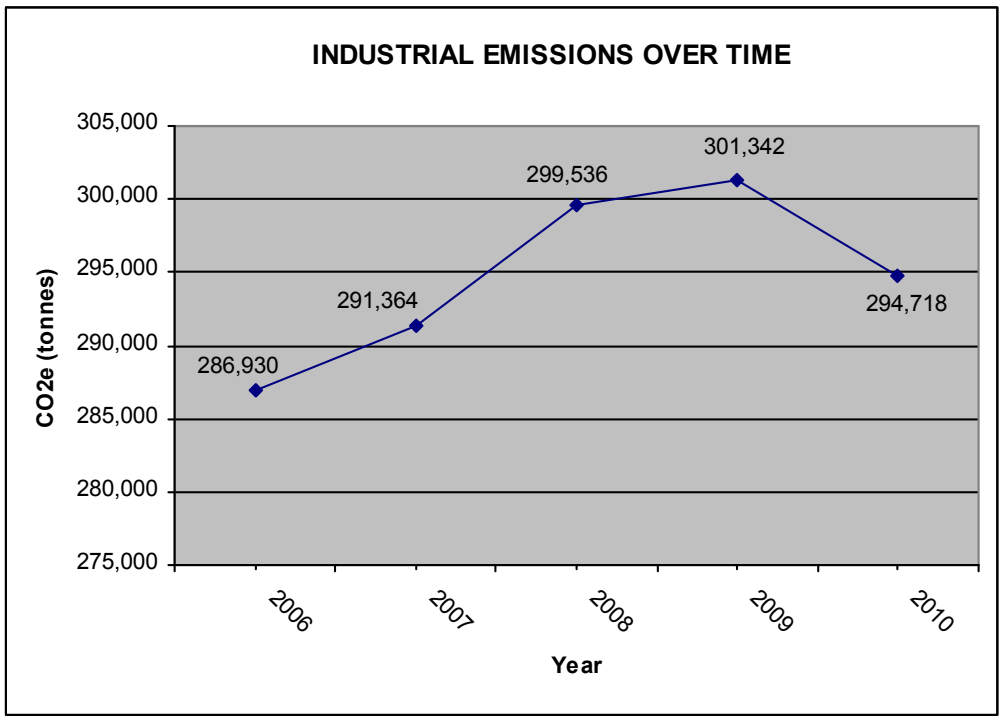

Figure 27: Oshkosh Industrial Emissions over Time

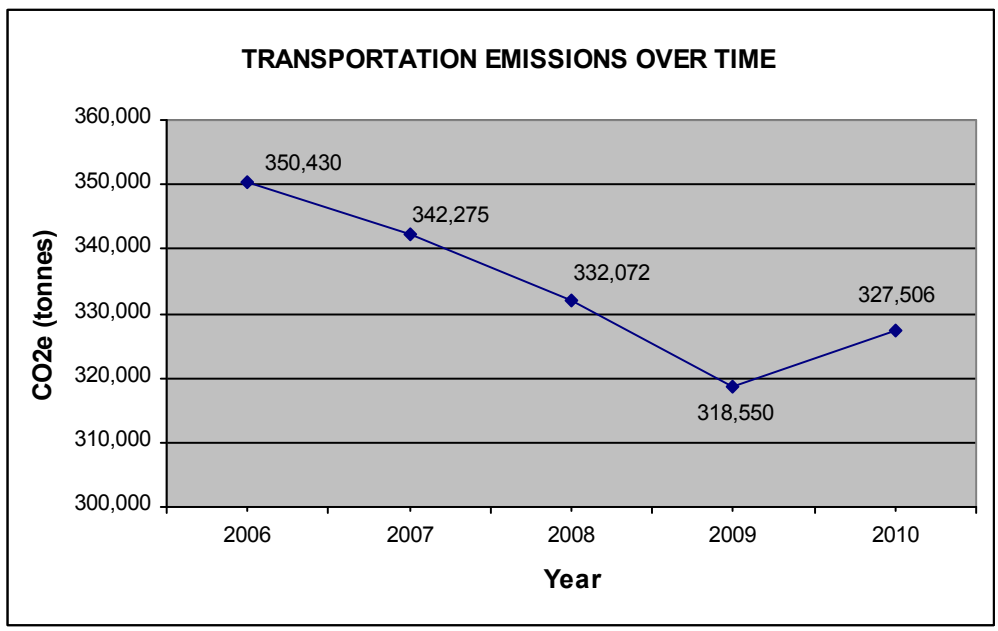

Figure 28: Oshkosh Transportation Emissions over Time

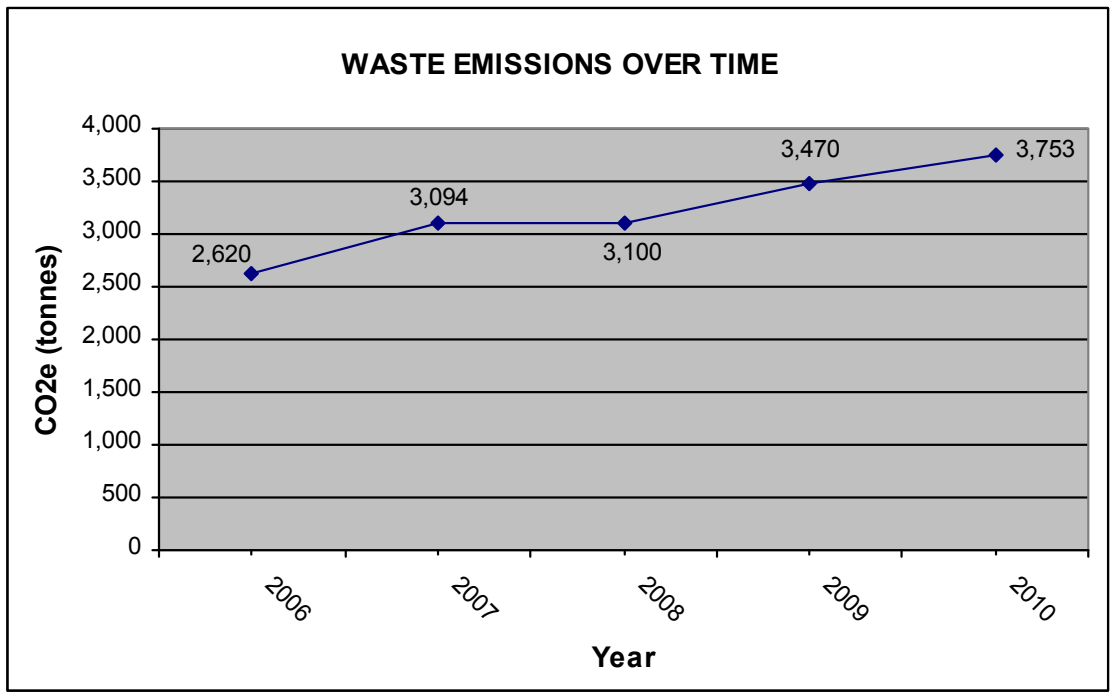

Figure29: Oshkosh Waste Emissions over Time

Greenhouse Gas Emissions Forecasting

By taking relevant trends into account, such as population growth, greenhouse gas emissions forecasting estimates what the volume of greenhouse gas emissions will be in the future if no further actions are taken by local government to reduce those emissions. To illustrate the potential emissions growth based on projected trends in energy use, driving habits, job growth, and population growth from the baseline year going forward, the Oshkosh Sustainability Board conducted an emissions forecast for the year 2017 using a business-as-usual scenario.

The projected population change for the city of Oshkosh was estimated as 1% growth. The 1% growth increase was chosen based on population growth rate and local economic activity indicators.

Community-Wide Greenhouse Gas Emissions Forecast

Under a business-as-usual scenario, the city of Oshkosh's community emissions, based on a 1% growth rate, will grow approximately 25.72% percent by the year 2017, from 1,476,056 to 1,849,505.87 metric tons CO_2e.

Municipal Greenhouse Gas Emissions Forecast

For the municipal operations analysis, no growth was anticipated in the municipal government operations thus we did not complete a greenhouse gas emission municipal forecast.

	Community-wide Analysis	Municipal Operations Analysis
Base year	2007	2007
Indicator growth rate	1%	No growth anticipated
Quantity of eCO2 emissions in base year (tons)	1,476,056	25,487
Forecast year	2017	2017
Business-as-usual projection of eCO2 emissions in 2017 (tons)	1,849,505.87	25,487

Source: CACP output

Greenhouse gas emissions forecasting is essential to setting realistic emissions reduction targets for ICLEI's Milestone 2.

Conclusion

The inventory results included here provide a GHG emissions baseline that Oshkosh will use to complete the next steps of the U.S. Mayors Climate Protection Agreement. Guided by ICLEI's 5 Milestone Process for Climate Mitigation, the Oshkosh Sustainability Advisory Board will evaluate and set GHG emissions reduction targets for local government operations and the community. In selecting this target, it will be important to strike a balance between scientific necessity, ambition, and what is realistically achievable. By establishing a challenging yet feasible target, Oshkosh can demonstrate its goal to do its part towards addressing GHG emissions. The Sustainability Advisory Board will survey GHG reduction targets of neighboring cities and counties as well as similarly-sized cities across the US, larger-scale agreements such as the US Conference of Mayors Climate Protection Agreement, state targets, and others. The Sustainability Advisory Board will present recommended targets to the Common Council for approval and, if accepted, adoption.

The steps of studying GHG emissions and setting goals to guide Oshkosh's efforts lead to the development and ongoing implementation of a Climate Action Plan. The Oshkosh Climate Action Plan will highlight the major initiatives Oshkosh has already implemented since 2007 and add to these initiatives to meet our GHG emissions reduction targets. Selected actions will be included in the Climate Action Plan that will not only comprehensively reduce energy costs and GHG emissions but also reduce the community's vulnerability towards climate change (climate adaptation). ICLEI has a program and support resources to help interested communities understand their vulnerabilities and identify actions to increase resilience (Climate Resilient Communities™ program).

The implementation of projects is, of course, the most important part of this process. By laying the groundwork through the GHG emissions inventory, reduction target, and climate action planning process, the Sustainability Advisory Board will have the ability to prioritize the very best emissions reduction measures. Finally, by periodically updating inventories, creating new baselines, and adding new initiatives to the Climate Action Plan, the Sustainability Advisory Board will be able to track and report Oshkosh's progress in protecting the climate and demonstrate reductions in emissions.

As Oshkosh moves forward with considering emission reduction strategies, the Sustainability Advisory Board should identify and quantify the emission reduction benefits of climate and sustainability strategies suggested within the Oshkosh Sustainability Plan that could be implemented in the future, including energy efficiency, renewable energy, vehicle fuel efficiency, alternative transportation, vehicle trip reduction, land use and transit planning, waste reduction and other strategies. Through these efforts and others, Oshkosh can achieve additional benefits beyond reducing emissions, including saving money and improving Oshkosh's economic vitality and its quality of life. The Sustainability Advisory Board will continue to update this inventory as additional data becomes available.

City of Oshkosh Sustainability & Climate Change Mitigation Activities

Recently, the City of Oshkosh has taken major steps to increase sustainability efforts and programs throughout the community. For example, in 2009 the City of Oshkosh completed an energy audit and began to retrofit some City-owned buildings to improve energy efficiency to reduce Oshkosh's energy consumption.

In 2010, the City's Parks Department, working with the Oshkosh Area Community Foundation, introduced the Taking Root Campaign which promised to plant 1,000 trees per year. The Public Works department began using a single-stream recycling collection system and installed four roundabouts to increase safety and reduce fuel consumption and energy use. Oshkosh Transit added four hybrid buses to their fleet and adjusted signal timing for efficient traffic flow. The Police Department began using bike and foot patrols and installed LED flashlights and emergency lighting on squad cars. Also, the City's Sustainability Advisory Board put together a water conservation brochure to spread sustainability awareness.

Additionally, in 2011 the City adopted a Bicycle and Pedestrian Circulation Plan to promote multi-modal transportation while also providing adequate education, encouragement, evaluation, and enforcement programs. The Sustainability Advisory Board's Sustainability Plan Steering Committee worked to complete a Sustainability Plan which set sustainability goals for the community. The Parks Department/Oshkosh Area Community Foundation continued with the Taking Root Campaign by planting 1,840 trees on local street terraces and the newly constructed Riverwalk located along the Fox River. The Public Works Department increased recycling by 70.4 tons from last year due to the new single-stream recycling collection system and crushed 53,000 tons of concrete for reuse.

How can you help Oshkosh reduce GHG emissions?

Small behavioral changes can make a large impact in energy savings – and therefore, carbon footprint reduction – over time. Make a deliberate effort to educate your family, your coworkers, and others that you share space with to:

1. Turn lights off in unoccupied spaces and when leaving for the day
2. Set computers to switch to sleep mode after five minutes
3. Turn thermostats down when leaving for the day
4. Unplug appliances
5. Dress for energy-efficient temperatures
6. Use less hot water
7. Avoid using products with a lot of packaging
8. Take stairs instead of elevators
9. Walk, bike, carpool, or use public transit
10. Recycle more