

Kalkaska County



Kalkaska County Comprehensive Assessment

An Energy Use & Greenhouse Gas
Emissions Inventory of County
Government Operations

February 2011

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Foreword



*Building a brighter
economic future in a
carbon-constrained
world*

Local governments like Kalkaska County are uniquely positioned for leadership in achieving wins for people, place, and planet. Regardless of whether the potential impacts of climate change are felt by the people of Kalkaska in the next five years, fifty years or ever, taking action to save costs on energy used by government operations is a clear win-win-win for local tax-payers, regional air quality, and the global environment *today*. The use of fossil fuels and electricity produced from fossil fuels as well as solid waste generated from local government operations are directly linked to reduced air quality, greenhouse gas emissions, and rising operating costs. Therefore strategic actions to reduce solid waste generation and smarter use of energy can result in significant reductions in both emissions and costs.

Strategic action begins with an analysis of operational assets and liabilities and progress is gauged against benchmarks of performance. The enclosed report is a baseline comprehensive assessment of energy use and greenhouse gas emissions generated by County government operations. This assessment is a valuable tool for identifying which aspects of county government hold the greatest liabilities and potential for cost, energy, and carbon savings and it establishes a benchmark upon which to evaluate the County's progress in efficiency.



Executive Summary

A Climate for Change

The cost of using energy is rising with global demand and regulatory responses to the environmental impacts of fossil fuels. At the same time resources to assist local governments, businesses, and residents in achieving greater levels of efficiency are evolving. Action begets access to these resources. Federal, state, and other financing options are requiring or at least giving preference to institutions that are demonstrating first steps in taking action to reduce energy and emissions. Thankfully energy awareness on the part of County staff and expectations from the community are creating a climate for local governments to lead and make responsible use of public resources.

A Program of Action

Kalkaska has taken important steps to establish itself on a path of energy action by partnering with other area counties to receive Federal Recovery Act funds. These Energy Efficiency and Conservation Block Grant (EECBG) funds awarded in 2010 provided capital funds and built capacity for energy efficiency and greenhouse gas emission reduction in Northwestern Michigan. With this funding and regional collaboration the Northwestern Michigan Regional Energy Network was formed, establishing a regional partnership with the International Council for Local Environmental Initiatives (ICLEI) initiating Kalkaska's participation in ICLEI's five milestone program for responsible management and practical reduction of energy and emissions. The enclosed comprehensive assessment of energy and greenhouse gas emissions represents completion of the first step in this process.

A Foundation for Progress

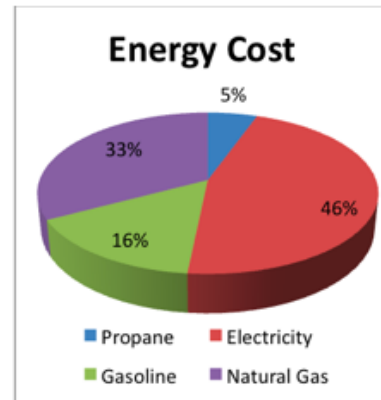
The baseline inventory of 2009 operations determined the following:

- County government energy use and waste management resulted in net annual emissions of 2,884 MT CO₂-e, equivalent to the amount of carbon dioxide sequestered by 615 acres of pine forest annually. These operations cost the County \$430,544 in total.
- Nearly half of these emissions and costs came from the consumption of electricity in County buildings and facilities. The Kaliseum and Administration Building electricity and natural gas use represent of 75% building energy expenditures and emissions.
- A survey of County staff energy conservation practices indicates a culture of energy conservation at home and an awareness and motivation to improve energy and cost efficiency at work.

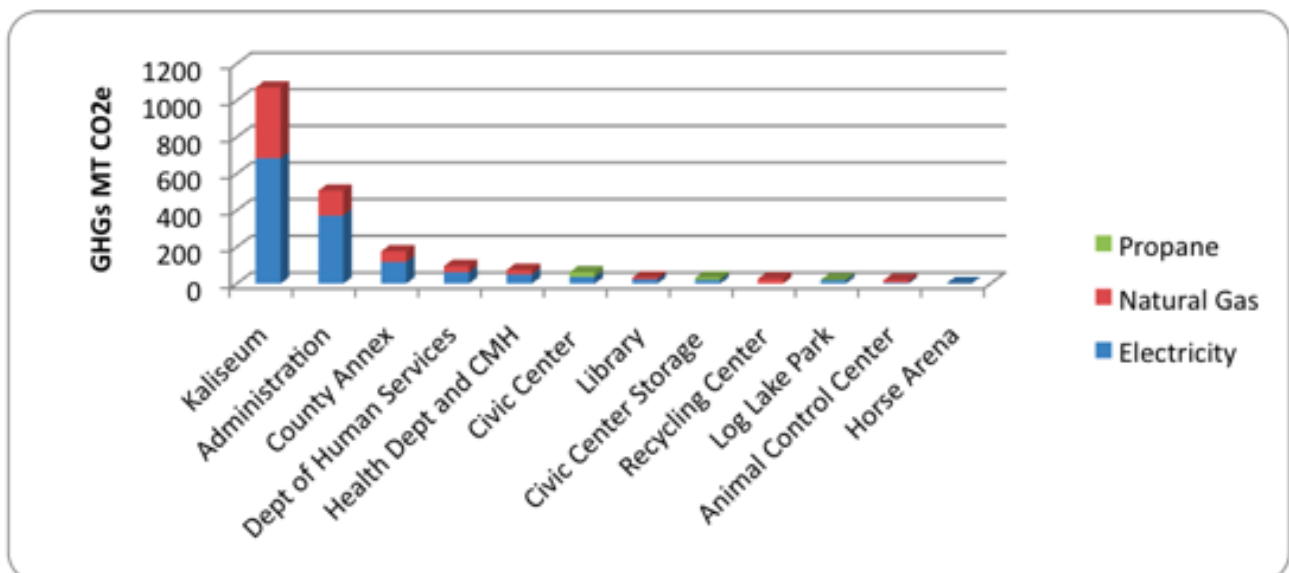
Recommended Next Steps:

- Establish a comprehensive energy and greenhouse gas emissions reduction goals and objectives.
- Create a comprehensive plan of action built around these goals that incorporates measures from the County Energy Action Plan currently under development.
- Assign a staff member to serve as an energy management liaison or part-time County energy manager to monitor energy projects, savings, and progress toward goals.
- Expand the County's Energy Savings Account to include cost savings from all projects.

County Energy Cost by Energy Source



Building & Facility Greenhouse Gas Emissions by Energy Source



Background

Nationally, nearly one-third of energy used in government buildings is wasted due to energy inefficiency¹.

Expenditures on energy and solid waste management at facilities and fuel for vehicles owned by local governments typically hold substantial potential for reduction. Not only are energy purchases and solid waste management expensive, these activities also contribute to the release of criteria air pollutants, emissions directly affecting local and regional air quality, and the release of greenhouse gases, which are of global concern. Criteria air pollutants include precursors to smog formation, particulates and other substances that pose serious local health risks to asthmatics, children, the elderly and individuals with heart and lung diseases. These same pollutants pose health risks to everyone who is chronically exposed.

Greenhouse gases (GHGs) pose longer-term more global risks. The current and growing rate of emission of these gases to atmosphere threatens to disturb the balance of the Earth's natural greenhouse effect that may result in drastic and long-term global climate change. The three greenhouse gases most commonly tracked by local governments are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). All three gases can be emitted during the combustion of fossil fuels for heating, transportation, and electricity production. Methane (CH₄) is particularly potent and is emitted during decomposition of solid waste in landfills.

These adverse effects of our energy and waste choices may be mitigated through a variety of actions including measures that save local governments money and provide greater energy security for communities.

Why should local governments take action?

Short Term – As government budgets grow tighter due to reduced revenues, communities are demanding better value for tax dollars. Taking action to reduce energy and waste makes sense, because these actions reduce operating costs, improve local air quality, and pay for themselves.

Mid Term – Demand for energy nationally and globally continues to drive rising costs. Current federal greenhouse gas regulations that go into effect in 2011 will likely raise the price of fossil energy. This means that the value of energy efficiency measures will also continue to climb.

Long Term – Energy security, the feeling that we will have enough energy resources to provide for our community, is of growing interest. As fossil fuels get scarcer and more expensive it becomes increasingly obvious that communities cannot start too early to prepare for energy self-reliance. This means reducing consumption through efficiencies as well as producing power

¹ Energy Star 2005. Local Governments: An Overview of Energy Use and Energy Efficiency Opportunities energystar.gov/istar/pmpam/index.cfm?fuseaction=portfolio.portfolioView accessed 1/21/2011

through clean, renewable resources. This kind of action will improve air quality locally and also mitigate the most severe potential effects of climate change around the globe. Changes in temperature and precipitation intensity will likely negatively affect tourism, fishing, local agriculture, and the demands on community infrastructure. Taking action to reduce these risks can direct County dollars into the local economy and better prepare the community for global uncertainties.

For more detail on the local economic and health benefits of reducing fossil energy consumption see Appendix A.

Management of risk often begins with measurement and a comprehensive assessment of energy use and greenhouse gas emissions provides the measurement from which to map a course of strategic action.

In Fall 2009 Kalkaska County took action in joining Antrim, Benzie, and Wexford Counties; the Northwest Michigan Council of Governments (NWMCOG); Northwestern Michigan College (NMC); and SEEDS, a local energy and environmental analysis non-profit, in applying for Federal Recovery Act's Energy Efficiency and Conservation Block Grant (EECBG) funding available through the Michigan Department of Energy, Labor, and Economic Growth. The application sought to establish a Regional Energy Network (REN) to assist county, city, village, and township governments in realizing greater energy independence. The EECBG funding awarded has financed energy efficiency projects, energy audits, energy trainings, assessment of renewable energy potential at county facilities, and comprehensive assessment of energy use and greenhouse gas emissions among county government operations.

The establishment of the Network also made way for a regional partnership with ICLEI, the leading international organization dedicated to assisting local governments striving for sustainability. This partnership provides Kalkaska and other governments in the region with access to energy and greenhouse gas emission management training, software, planning guides, peer and professional networking, and other resources.

ICLEI's five milestone program for greenhouse gas mitigation is the standard among local governments and has been adopted by more than 850 communities internationally, including more than a dozen in Michigan. The five milestones are:

1. Conduct a baseline emissions inventory and forecast of GHG emissions,
2. Adopt an emissions reduction target for a forecast year,
3. Develop a Local Action Plan,
4. Implement plan strategies, and
5. Monitor and verify results.

The enclosed comprehensive assessment represents Kalkaska's achievement of the first milestone.

For more in-depth information on greenhouse gas emissions, climate change, climate regulation, and emission reduction initiatives see Appendix A.

Method

Measuring greenhouse gas emissions begins with better management of operational costs.

The first step toward reducing energy expenses and greenhouse gas emissions is to identify baseline levels and sources of emissions as well as the sectors of government operations that are responsible for the bulk of these emissions. This information can be then used to inform the selection of reduction goals and develop a local plan of action. Emissions are estimated by applying standardized emission factors to local government records of energy use or waste generation.

For example, from monthly utility bills we may know that a particular building spends \$20,000 a year for the 200,000 kilowatt-hours (kWh) of electricity that it consumes. Because the US EPA monitors and reports greenhouse gas emissions from power plants we know that for every kWh of electricity purchased from the regional electricity grid in Northern Michigan that on average 1.6 pounds of greenhouse gases (lbs CO₂-e) are emitted to the atmosphere.

Similarly from County fleet records we may know that \$20,000 in diesel fuel was purchased annually for 8000 gallons of fuel for fleet trucks. Based on national emission standards, we know that on average 22 lbs CO₂-e are also emitted per gallon of diesel fuel burned for the heavy truck vehicle class and a particular model year.

Table 1: Emissions Estimation Example

| Examples | Annual Expense | Energy | Units | Cost per Unit Energy | Emission Factor: (lbs of GHGs per Unit Energy) | Total Annual tons of GHGs | Cost per ton of GHGs emitted |
|-----------------|-----------------------|---------------|----------------|-----------------------------|---|----------------------------------|-------------------------------------|
| Building | \$20,000 | 200,000 | kWh | \$0.10 | 1.6 | 160 | \$125 |
| Truck Fleet | \$20,000 | 8,000 | gallons diesel | \$2.50 | 22 | 88 | \$227 |

By Inventorying and comparing the two we see that different amounts of emissions result from expenditures on different types of energy. Likewise investments and actions taken to reduce these energy expenses will yield differing financial and environmental returns. Comprehensively assessing these expenditures provides the foundation for strategic planning and investment to maximize cost and carbon savings.

ICLEI – Local Governments for Sustainability assists local governments in systematically tracking these energy and waste related activities and cost by providing software and a standardized methodology for estimation and reporting emissions.

ICLEI's Clean Air Climate Protection (CACP) software tracks emissions of greenhouse gases (primarily carbon dioxide, methane, and nitrous oxide) that result from the use of electricity, fuel, and waste disposal. It then reports the greenhouse gases cumulatively in equivalent carbon dioxide emissions² (CO₂-e).

Method Summary:

Software: The County government inventory performed by SEEDS was prepared using the CACP 2009 software and its default calculations, values, and assumptions unless otherwise noted. Additional calculations related to solid waste and recycling were completed using the US EPA's Waste Reduction and Assessment Model (WARM).

Base Year: To set energy and emission reduction targets government operations were inventoried for a specific base year, calendar year 2009, against which all future reduction measures will be compared.

Scope: The scope of analysis generally includes electricity, natural gas, propane and refrigerants used by facilities, vehicles, and equipment that are directly financially controlled by the County government. However this inventory also includes four activities – employee commuting, reimbursed business travel, solid waste generation, and solid waste recycling that result in emissions indirectly controlled by County operations.

Data Sources: Data for the inventory were collected from county utility expense records, facility records, and staff surveys.

For more details on the software, scope of analysis, and emission factors and data sources used please see Appendix B.

² Because different greenhouse gases have different impact intensities, total emissions are converted to carbon dioxide equivalents (CO₂-e) to provide a standard unit of measurement.

Findings

Kalkaska County's staff holds promise for energy and emissions reductions

The total annual greenhouse gas emissions from Kalkaska County operations in 2009 are estimated at 2,884 metric tons of carbon dioxide equivalents (MT CO₂-e). To place these emissions in more tangible terms, 2,884 MT CO₂-e is similar to the amount of carbon dioxide emitted from 551 passenger cars annually, or the amount sequestered each year by 615 acres of pine forest, or released from the burning of 15 railroad cars' worth of coal³.

Table 2: 2009 County Government Baseline Totals

| Total Annual | Value | Units |
|--------------------------------------|--------------|------------------------------------|
| Total Energy Consumed | 27,881 | MMBtus |
| Total Operating Costs | \$ 430,544 | (excluding employee commute costs) |
| Total GHG Emissions Generated | 2,884 | MT CO ₂ -e |

These emissions resulted from the consumption of energy and disposal of solid waste for which the County paid \$430,544.

Energy Source Analysis

Given that energy consumption is the primary driver of County government greenhouse gas emissions, it is important to consider the characteristics of different energy sources.

Figure 1 illustrates that electricity is the dominate contributor at nearly half of energy-based GHG emissions and energy cost. However, electricity makes up only a quarter of County government energy use.

³ US EPA Greenhouse Gas Emissions Equivalencies Calculator <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

This comparison illustrates that emission-per-unit energy consumption is not equivalent for all energy sources. For each unit of electricity consumed, energy is lost in its transmission and distribution, which results in a higher emissions profile than fuels combusted for transportation or heating.

Table 3 lists the assumed emissions factor of energy sources consumed by Kalkaska County operations as million British thermal units (MMBtu).

Table 3: Average Emissions per Unit Energy by Source

| Source | Kilograms CO ₂ -e per MMBtu |
|--------------------------|--|
| Electricity ⁴ | 208 |
| Gasoline | 70 |
| Propane | 63 |
| Natural Gas | 53 |

Table 4 compares the average price Kalkaska paid for various energy sources relative to the average commercial price paid nation-wide in 2009. During that year the County paid markedly higher prices than the U.S. averages for all energy sources but gasoline.

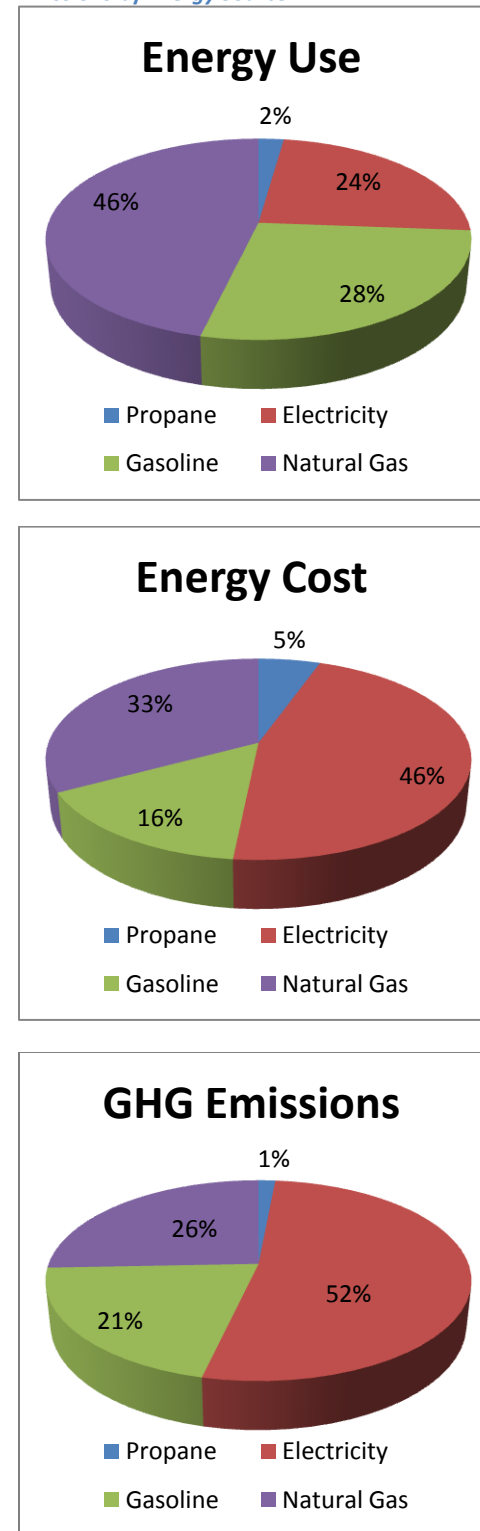
Table 4: Average Price Paid per Unit Energy by Source

| Source | \$ per MMBtu Kalkaska County | \$ per MMBtu US Average ⁵ |
|--------------------------|------------------------------|--------------------------------------|
| Electricity ⁶ | \$29.13 | \$27.25 |
| Gasoline | \$14.70 | \$20.42 |
| Propane | \$37.05 | \$19.24 |
| Natural Gas | \$10.73 | \$8.88 |

⁴ Electricity emission efficiency is based on the most current emission factors available for the RFC Michigan regional grid as published by the US EPA's eGRID site.

⁵ US Energy Information Administration Annual Energy Review

Figure 1: Kalkaska County Energy, Cost, & Emissions by Energy Source



Sector Analysis

Total emissions and energy use of Kalkaska County government operations are divided by sectors. It is important to note that the energy costs depicted in Figure 2 and Table 5 include energy utility costs and fleet fuel costs but do not include the cost of fuel for employee commutes in personal vehicles.

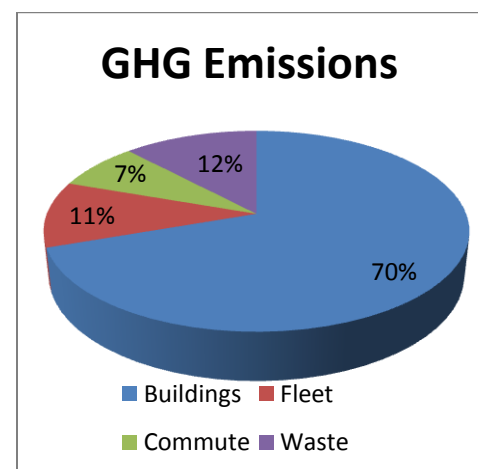
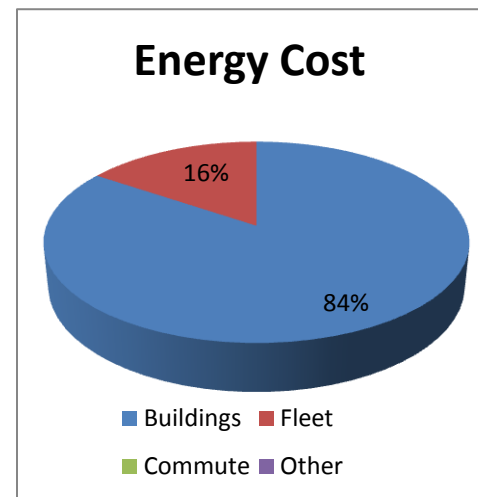
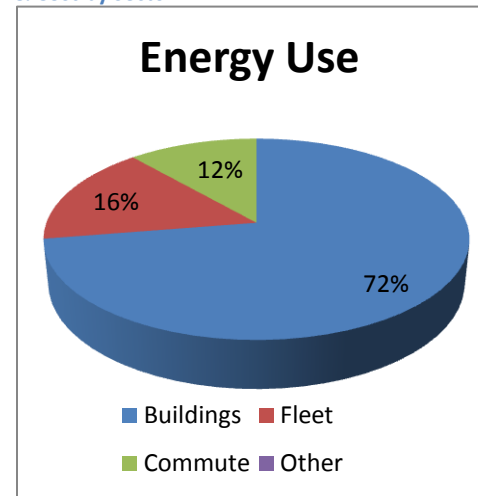
Figure 2 clearly demonstrates that Kalkaska County buildings and facilities contribute more than two-thirds of the total emissions, energy use, and operating costs.

Table 5: Energy, Emissions, and Cost by Sector and Source

| Sector | Source | GHGs (MT CO2e) | Energy (MMBtu) | Cost (\$) |
|------------------|-------------|----------------|----------------|------------------|
| Buildings | | | | |
| | Electricity | 1,396 | 6,679 | \$194,561 |
| | Natural Gas | 686 | 12,898 | \$138,371 |
| | Propane | 40 | 626 | \$23,191 |
| Fleet | | | | |
| | Gasoline | 324 | 4,470 | \$65,707 |
| Commute | | | | |
| | Gasoline | 232 | 3,207 | |
| Other | | | | |
| | Solid Waste | 234 | | \$8,715 |
| | Recycling | -6 | | |
| Total | | 2884 | 27,881 | \$430,544 |

It is important to note that the energy costs depicted in Figure 2 and Table 5 include energy utility costs and fleet fuel costs but do not include the cost of fuel for employee commutes in personal vehicles.

Figure 2: Kalkaska County Energy, Emissions, & Cost by Sector



Building & Facility Sector Analysis

The County Accounting Department now monitors monthly facility energy use and costs through Energy Star Portfolio Manager (ESPM). County utility records were retrieved from ESPM for the calendar year of 2009 and entered into ICLEI's CACP software to establish the emissions inventory of County facilities. The inventory depicted in Figure 3 and Table 6 reveals that the Kaliseum and Administration buildings together represent nearly 75% of emissions from building energy use and over 50% of total County emissions and operating costs.

Figure 3: Building & Facility Greenhouse Gas Emissions by Energy Source

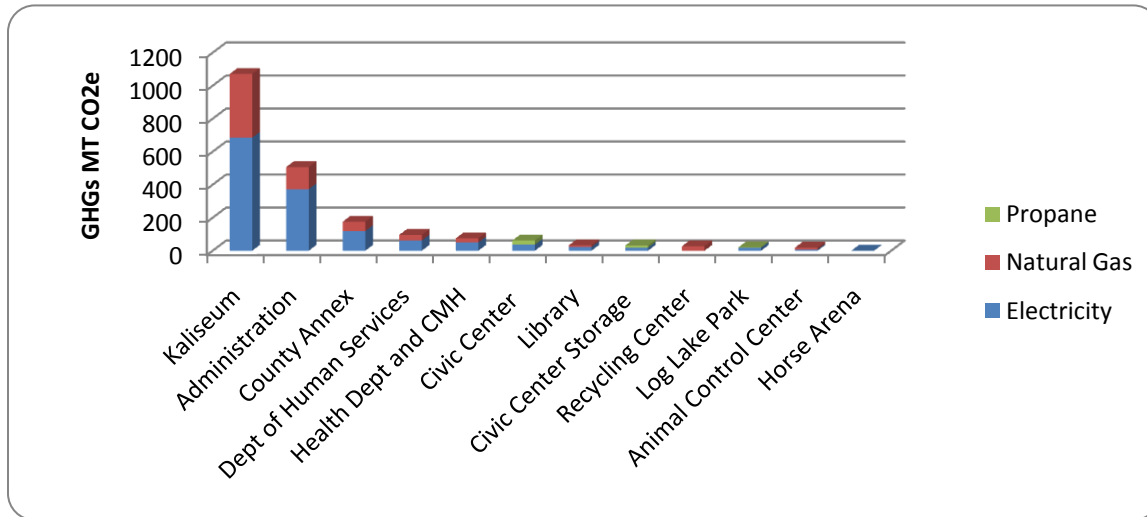


Table 6: Building & Facility 2009 Energy Use Inventory

| Facility | Total Floor Space (Sq. Ft.) | Electric Use (kWh) | Natural Gas/Propane Use (therms) | Total Energy Cost (\$) | Total GHGs (MT CO2e) |
|----------------------------|-----------------------------|--------------------|----------------------------------|------------------------|----------------------|
| Administration | 35,578 | 524,153 | 25,359 | \$80,175 | 507 |
| Animal Control Office | 1,720 | 9,583 | 2,350 | \$4,028 | 19 |
| Civic Center | 8,500 | 52,248 | 4,699 | \$20,755 | 62 |
| Civic Center Storage Bldg. | 3,360 | 26,959 | 2,372 | \$11,148 | 32 |
| County Annex | 15,089 | 167,697 | 10,310 | \$26,739 | 177 |
| Dept. of Human Services | 8,039 | 87,141 | 6,447 | \$17,384 | 96 |
| Health Dept./CMH Bldg. | 5,783 | 70,266 | 4,775 | \$12,658 | 75 |
| Horse Arena Judging Stand | 100 | 1,162 | - | \$340 | 1 |
| Kaliseum | 58,113 | 955,640 | 73,645 | \$165,355 | 1,070 |
| Library | 2,880 | 31,937 | 1,936 | \$6,164 | 33 |
| Log Lake Park | 1,560 | 26,946 | 797 | \$6,275 | 21 |
| Recycling Center | 4,500 | 458 | 4,941 | \$5,813 | 27 |
| Total | 145,222 | 1,954,190 | 137,631 | \$356,123 | 2121 |

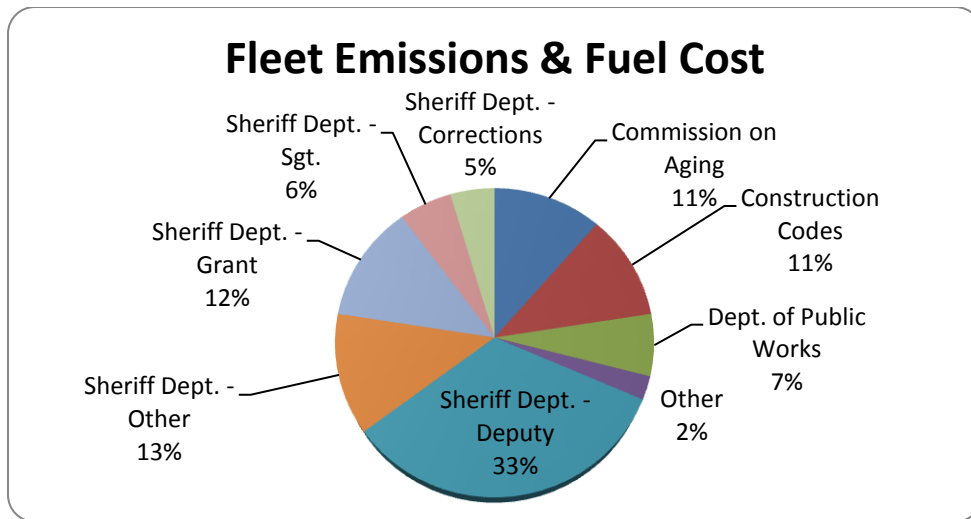
Table 6 provides a snapshot of building energy use that may be used as a benchmark against which to compare future years' energy reductions. It is important to recognize, however, that facility energy use is typically highly influenced by weather, numbers of staff and computers, and operating hours. Therefore detailed analysis of building energy performance should be evaluated using Energy Star Portfolio Manager or other means of adjusting for weather and changes in facility use.

For more details on Energy Star Portfolio Manager and adjusting for changes in weather and facility use please see Appendix C.

Transportation Fleet Sector Analysis

The County's existing inventory of fleet vehicles includes vehicle types and annual miles traveled per vehicle and is divided among 18 departmental categories. Using 2009 fuel prices provided by the County Accounting Department and average vehicle fuel efficiencies assumed by ICLEI's CACP software annual fuel cost and emissions were estimated. These estimates have been combined into 9 categories for ease of review. As with most county governments, the Sheriff's Department represents the largest cost and emissions contributor at a total of 69%, Figure 4.

Figure 4: Fleet Vehicle Emissions and Fuel Cost Broken Down by Departmental Categories



Other Sector Analysis

In addition to emissions resulting from the direct consumption of energy, other emissions sources were also considered for this inventory including fugitive emissions of refrigerants from heating ventilation and air-conditioning (HVAC) equipment at County facilities; indirect GHG emissions associated with land filling solid waste generated at county facilities; and the indirect reduction of GHG emissions by recycling materials instead of landfilling.

Refrigerants

Compared to CO₂ and other greenhouse gases associated with fossil fuel combustion, some refrigerants can be extremely potent greenhouse gases resulting in a much stronger atmospheric effect, so even small amounts that are leaked from equipment during storage or normal operation are of concern.

Based on the accounts of County facility staff and contractors used to service County HVAC units it was determined that all systems currently use a refrigerant called R-22. Because this particular gas is being phased out of use in North America it is not reported as a greenhouse gas emission⁷. As County HVAC systems are upgraded to new refrigerant types, inventories of those gases would need to be included in future GHG inventories.

Solid Waste & Recycling

Solid waste and recycling generated at Kalkaska County facilities were estimated from monthly invoice records, staff estimates, and volume to weight conversions provided by the U.S. Environmental Protection Agency (USEPA). The estimated tonnages were then evaluated using the USEPA's Waste Assessment and Reduction Tool (WARM)⁸ which estimates the net life-cycle greenhouse gas (GHG) emissions and energy demand or savings associated with landfilling or recycling solid waste materials.

County facilities reported monthly waste services for 2009 that, when projected annually, totaled 234 tons of municipal solid waste (MSW). Because this solid waste ends up in a landfill which emits methane gas during decomposition⁹, the associated annual greenhouse gas emissions are estimated to be 352 MT CO₂-e. In contrast, the annually projected 2 tons of cardboard that were recycled at municipal facilities *prevented*¹⁰ the emission of 6 MT CO₂-e.

Solid waste emissions amount to 8% of total County emissions. The small amount of recycling recorded at County facilities essentially offsets 1% of those solid waste related emissions inventoried with little to no investment. Actions taken in the solid waste sector can have a significant impact. Much potential exists at Kalkaska County facilities for reducing the amount of waste generated or increasing the amount diverted to recycling or other reuse services.

⁷ ICLEI Local Government Operations Protocol for GHG Emissions Inventories.

⁸ US EPA WARM details may be found at http://epa.gov/globalwarming/climatechange/wycd/waste/calculators/Warm_Form.html

⁹ As organic material breaks down in landfills it generates methane gas which is a greenhouse gas 24 times more potent than carbon dioxide. Landfill gas that is not captured and flared or burned for heat or electricity results in greenhouse gas emissions.

¹⁰ The US EPA WARM model also quantifies indirect energy usage and greenhouse gas emissions that are theoretically prevented by recycling. When recycled materials replace virgin materials in new products typically less energy used and less GHGs are emitted, those recycling has the potential prevent both emissions from landfills and emissions from product manufacturing and material extraction.

Table 7: Estimated Solid Waste & Recycling Tonnages & Emissions

| Facility | Waste Type | Tonnage (tons) | Net GHGs (MT CO ₂ e) | Cost (\$) |
|--------------------------------|------------------------|----------------|---------------------------------|----------------|
| Admin Complex | Solid Waste Landfilled | 86.4 | 130 | \$3,960 |
| | Cardboard Recycled | 0.6 | -2 | |
| Animal Control | Solid Waste Landfilled | 14.4 | 22 | \$960 |
| Annex Building | Solid Waste Landfilled | 28.8 | 43 | \$960 |
| | Cardboard Recycled | 0.1 | 0 | |
| Kalkaska County Library | Solid Waste Landfilled | 3.4 | 5 | \$390 |
| | Cardboard Recycled | 0.2 | -1 | |
| Log Lake Park | Solid Waste Landfilled | 28.8 | 43 | \$810 |
| | Cardboard Recycled | 0.1 | 0 | |
| Kaliseum | Solid Waste Landfilled | 57.6 | 87 | \$1,635 |
| | Cardboard Recycled | 0.2 | -1 | |
| Recycling Center | Solid Waste Landfilled | 14.4 | 22 | |
| Commission on Aging | Cardboard Recycled | 0.8 | -3 | |
| Total | Solid Waste | 234 | 352 | \$8,715 |
| | Cardboard | 2 | -6 | |

Employee Commute & Energy Use Survey

As the final component of the comprehensive assessment an “Employee Commute and Energy Use Survey” was circulated among County staff to estimate commute related emissions and costs to employees, as well as evaluate current energy conservation behaviors, identify potential savings opportunities, and measure support for new initiatives to save energy at the County. Responses were received from 44 of the 151 full-time and part-time County employees.

Based on the staff responses an average employee commute profile was generated and applied to the total number of days worked by County staff. Although 4.5% of employees carpool and 2% walk or bike, 98.5% of commute miles are spent in single occupancy vehicles. In total, it is estimated that staff spend nearly \$63,000 per year commuting to work with the average employee spending over \$500 to travel 27 miles each day, resulting in 232 MT CO₂-e, 7% of the County’s total greenhouse gas emissions.

Table 8: Average Employee Commute Profile Based on Survey Responses

| Statistic | Value | Units |
|--------------------------------|----------|-------|
| Daily Commute (one-way) | 14 | miles |
| Commute Mode | | |
| Personal Vehicle | 85.6 | % |
| Dept. Vehicle | 9.1 | % |
| Carpool | 4.5 | % |
| Bike | 1.1 | % |
| Walk | 0.7 | % |
| Vehicle Fuel Efficiency | 20.5 | mpg |
| Total Annual Fuel Costs | \$505.55 | |

The remainder of the survey results regarding energy use was very positive, indicating that the majority of county employees are already actively trying to save energy and would support new initiatives at the County. Some opportunities for improvement in the HVAC distribution systems were identified through comments about certain building areas being very cold and others very hot.

Personal Behavior

- 93.2% Turn off lights or unplug appliances
- 90.9% Adjust thermostats to reduce energy use
- 84.1% Use CFL bulbs
- 72.7% Buy Energy Star appliances
- 72.7% Recycle and reduce waste
- 79.5% Weatherize their home
- 100% Combine trips to save fuel
- 84.1% Make sure tires are properly inflated and engine is tuned up to improve fuel efficiency

Support for Energy Conservation

- (7.3/10) Support for new policies or initiatives to save energy.
- 77.3% Were motivated to save energy by beliefs or values

Potential for improvement in building operations and comfort

- 27.3% Use a fan during the summer
- 9.1% Use a personal heater in the winter
- 9.1% Open a windows in the summer or winter while the building is being heated or cooled

Relevant Comments:

- “I have tried to wear a fleece when I am cold, but the department does not like this because it is not part of my uniform.”
- “The air ducts to our office do not work therefore it is cold in the winter and too hot in the summer. We have asked many times to have them looked at but nothing. We can hear the heat kicking on, but nothing comes out, same with the air in the summer. Admin. Building”

Next Steps

*Already Kalkaska County is making
forward progress.*

With this comprehensive assessment Kalkaska County has completed the first of five ICLEI Milestones for energy, cost, and greenhouse gas reduction. This study of County Government operations establishes a working baseline for evaluating future action. It clearly identified buildings as the primary contributors. Notably electricity use at the Kaliseum and Administration buildings represents the biggest opportunity for cost and carbon savings.

These two facilities have recently been targeted for energy action. Parallel to and in conjunction with this assessment, Kalkaska has received funding for detailed energy audits and capital funds for energy efficiency projects. With assistance from the Northwest Michigan Council of Governments, G-Energy Inc., and SEEDS; Kalkaska is in the process of outlining a five-year energy action plan, The Kalkaska County Energy Efficiency and Renewable Energy Action Plan, that identifies fifteen measures at the Administration Building and Kaliseum that are expected to yield energy cost savings of almost \$47,000 annually based on an initial investment of \$40,000 in grant funds awarded from the Michigan Public Services Commission. The requires that a minimum of 50% of these savings are directed into an Energy Savings Account which will provide funds for additional energy efficiency projects within the County's operations. Kalkaska County also received \$40,000 in grant funds from the Federal Recovery Act to replace HVAC units and furnaces at the Administration Building and Annex, which will yield additional cost and energy savings.

These projects alone represent a 10% reduction in County baseline greenhouse gas emissions by the end of 2011.

Not only has Kalkaska completed the first ICLEI milestone but it is three-fourths of the way to completing the second and third ICLEI Milestone of developing a comprehensive energy and greenhouse gas action plan. In order continue this process in a strategic and directed manner the following next steps are recommended.

Recommended Next Steps

- Utilize the County Green Team to establish comprehensive energy and greenhouse gas emissions reduction goals and objectives that are responsive to both the current fiscal demands *and* the resource needs of future generations.
- Develop a comprehensive plan of action built around these goals that incorporates greenhouse gas reduction; measures from the current Kalkaska County Energy Efficiency and Renewable Energy Action Plan, and cost-effective strategies for fleet and solid waste management.
- Assign a staff member with a comprehensive perspective on County operations to serve as energy management liaison or part-time County energy manager to monitor energy and greenhouse gas reduction projects, document savings, and measure progress toward goals.
- Expand the scope of the Energy Savings Account to include cost savings from all facility energy efficiency, fleet fuel reduction, water conservation, and solid waste reduction projects and utilize these savings as a sustainable source of action plan financing.
- Continue to learn about energy and greenhouse gas emissions and sustainability best practices by accessing ICLEI-Local Governments for Sustainability's resources, education and networking opportunities through the Northwest Michigan Council of Governments—an ICLEI Member.



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Appendix A – Background on Greenhouse Gas Emissions & Climate Change

Climate and the Greenhouse Effect

The gases that trap heat in the Earth's atmosphere are sometimes referred to as greenhouse gases (GHG). When sunlight enters the Earth's atmosphere, some of this solar radiation is immediately reflected and leaves the planet without turning into heat. Some of it is absorbed by the ground, which then re-emits thermal radiation, heat. To maintain a consistent range of temperatures, incoming solar radiation must be balanced by the loss of heat escaping to space.

Greenhouse gases – including Carbon Dioxide (CO₂), Methane (CH₄), and Nitrous Oxide (N₂O) and others – create the atmospheric blanket that prevents large fluctuations between night and day temperatures. For example, the moon, which has no GHGs, fluctuates from night-time temperatures of 300°F below zero to over 200°F during the day. GHG traps the heat absorbed by the earth, slowing its escape into space.

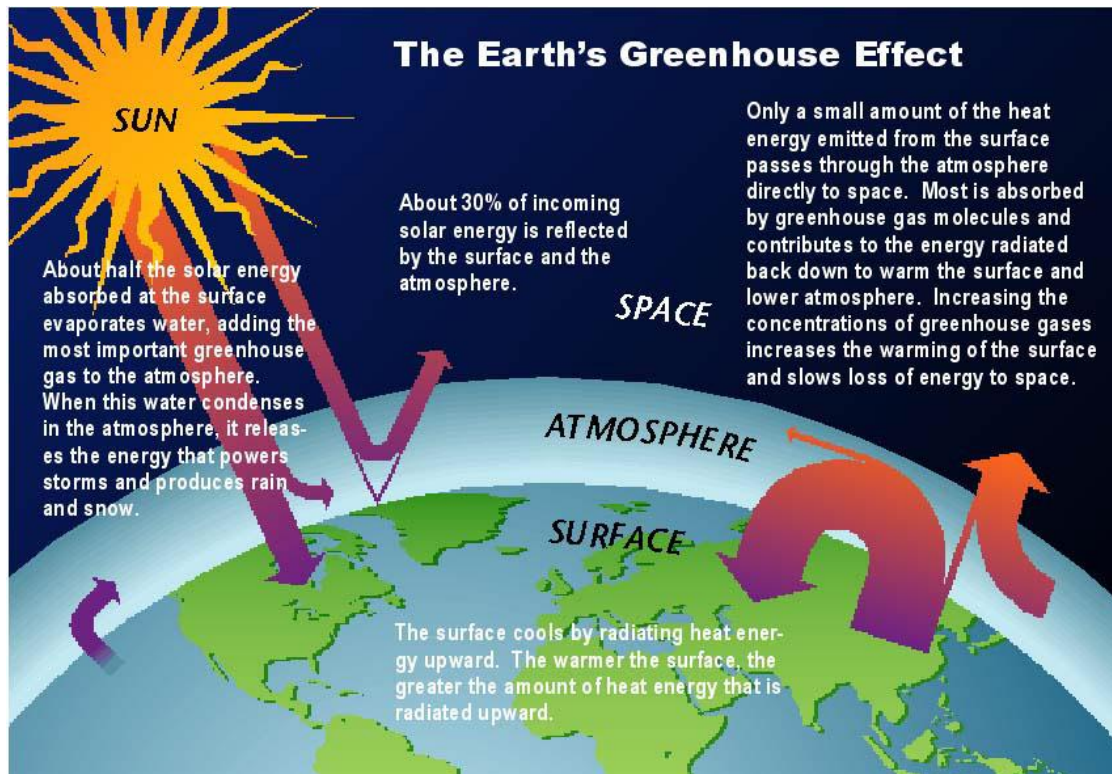


Figure 5: The Greenhouse Effect¹¹

This greenhouse effect is a natural occurrence. It happens on Earth and is in effect on every planet that has an atmosphere, including Venus. However, on Venus, the high concentration of GHGs in its atmosphere means that its surface temperature is a consistently sweltering >800°F.

¹¹Source: US Global Change Research Information Office

We cannot survive without our atmosphere and the greenhouse gases it contains, but the concentration of these gases in our atmosphere is triggering change in Earth's climate.

Greenhouse Gas Levels and Trends

From the time humans first appeared on the planet to the beginning of the Industrial Revolution, the atmospheric concentration of CO₂ remained consistently well under 300 parts per million (ppm). Beginning in the 18th century, humans started burning coal and gas, taking carbon that was stored under the earth for millions of years and releasing it into the atmosphere in a matter of decades.

Our current atmospheric concentration of CO₂ is now over 380 ppm and rising. This rise has been correlated with global warming¹², which may lead to glacial melting, increased drought, increased storm intensities, rising sea levels, and the spread of insect-borne diseases like Lyme and malaria. And because it takes time for our climate to adapt, we are not yet experiencing the full effect of our current level of CO₂, which continues to increase unabated¹³.

International scientific and political communities recognize that we are facing alterations in weather patterns, ocean behavior, and biological processes. As James Hansen of National Aeronautics and Space Administration (NASA) wrote recently, "If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO₂ will need to be reduced from its current 387 ppm to at most 350 ppm."¹⁴

Previous efforts to set GHG reduction goals, such as the Kyoto Protocol, were based on stabilizing atmospheric CO₂ to 550 ppm, 200 ppm more than the updated target. The current scientific consensus is that our climate and way of life is at much greater risk within a shorter timeframe than previously thought.

Climate Change: Global & Local Effects

Globally, increases in GHG's subsequently mean global temperatures are expected to affect water availability, ecosystem health, food production, coastal security, and human health. Figure 2 charts the Intergovernmental Panel on Climate Change's expectations for the occurrence and severity of effects with increasing temperature above the temperatures of the late 20th century.

Locally, by the end of this century climate change is expected to shift Northern Michigan's climate to mimic winters typical of Ohio and summers typical of Missouri as depicted in Figure 7. This shift would likely affect Northern Michigan in some of the following ways:

¹² US Global Change Research Program, Our Changing Planet: US Climate Change Science Program for Fiscal Year 2009

¹³ Hansen, James, et al. [Target Atmospheric CO₂: Where Should Humanity Aim?](#) Submitted April 7, 2008.

¹⁴ Hansen, James, et al.

- More severe weather and susceptibility to flooding
- Reduced air quality and water quality
- Economic threats due to crop damage and reduced snow
- Higher rates of infectious diseases and heat-related illnesses and deaths
- Increased spread of mosquito and tick-borne diseases such as Lyme disease
- Damage to many natural resources including the sugar maple
- Fluctuations in water levels
- Higher prices and shortages of basic goods, such as food and energy.

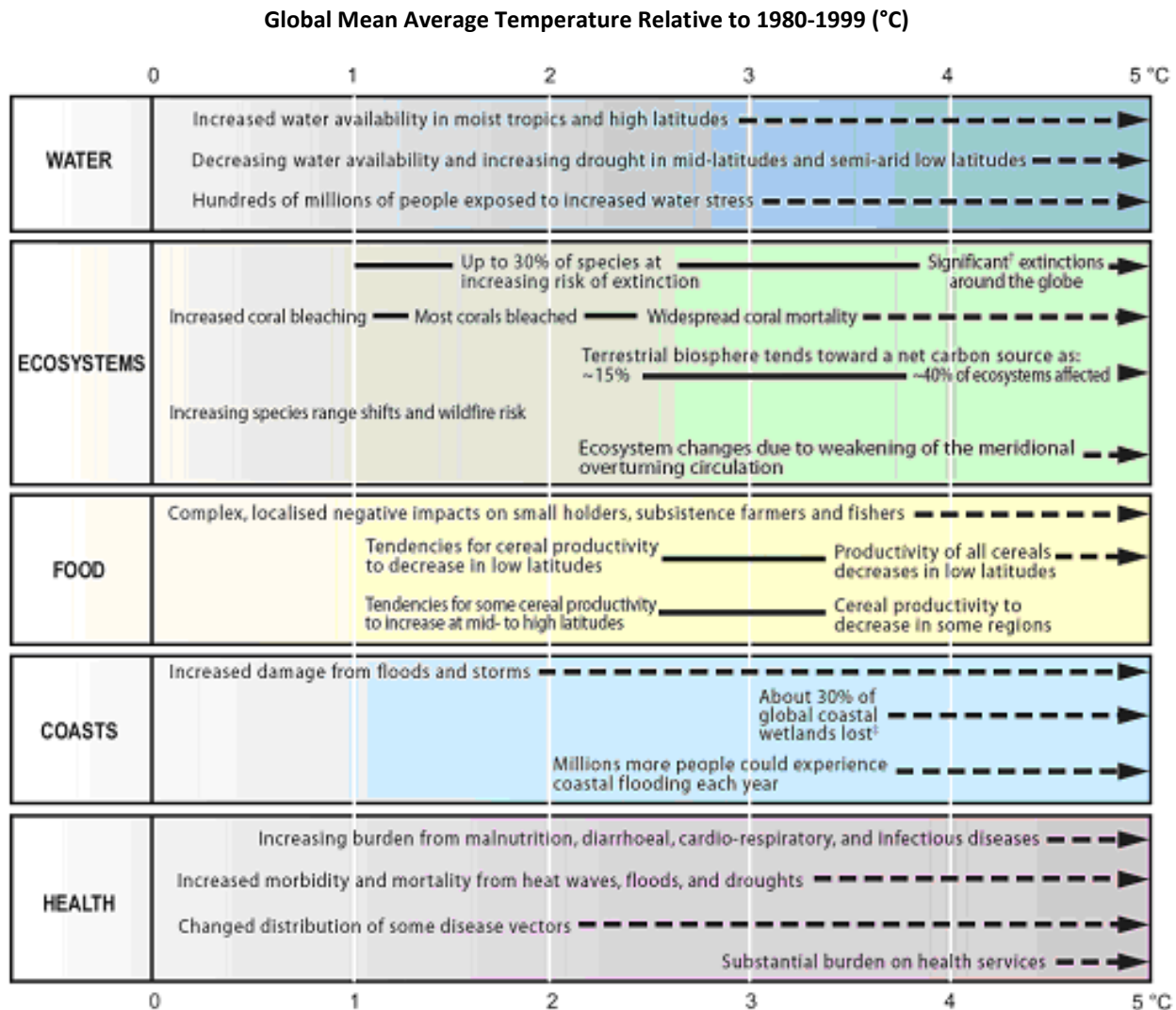


Figure 6: Expected effects with rising temperature (Adapted from: IPCC AR4 Synthesis Report¹⁵)

¹⁵ IPCC Assessment Report 4 – Climate Change 2007: Synthesis Report

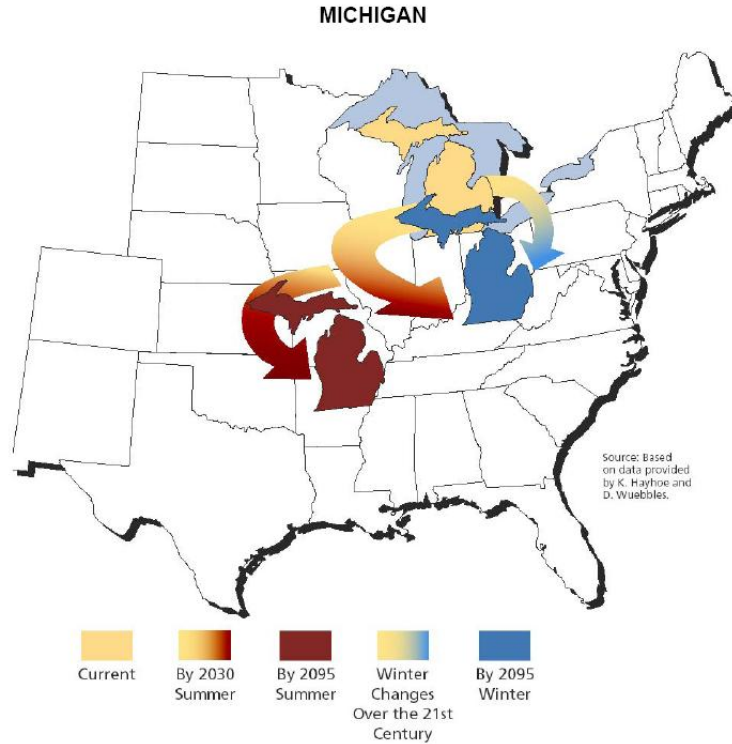


Figure 7: Expected Change in Michigan Climate (Source: Union of Concerned Scientists)

Already the incremental change in local temperatures is apparent in the frequency of winter freezing of Grand Traverse Bay over the previous 150 years.

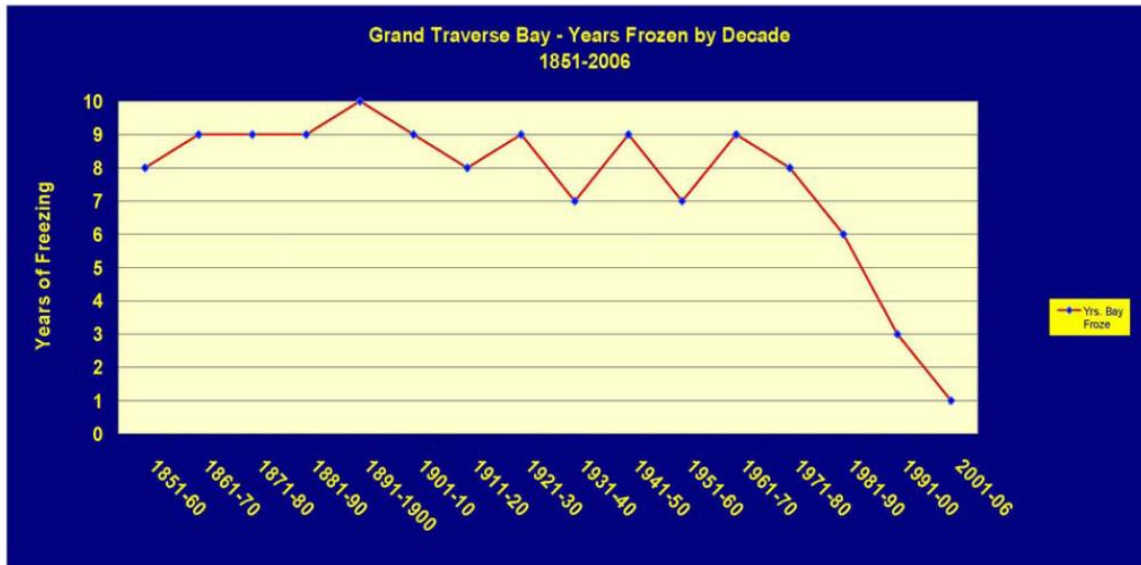


Figure 8: Grand Traverse Bay's Documented Decline in Freezing (Source: Anderson 2007)¹⁶

¹⁶ Adapted by the Center for Integrative Environmental Research, original data obtained from Traverse City Chamber of Commerce

Greenhouse Gas Sources

With 5% of the world's population, the United States accounts for approximately 25% of the world's human GHG emissions and 30% of the world's waste¹⁷. Human or anthropogenic sources of GHG emissions include,

- FOSSIL FUEL COMBUSTION – Carbon dioxide emitted from the combustion of fossil fuels for heating, transportation, and electricity production represents by far the largest fraction of global GHG emissions;
- DEFORESTATION & LAND USE CHANGE – When biologically productive ecosystems are disturbed, carbon dioxide may be released from soils and decrease the ability of ecosystems to uptake and retain carbon.
- AGRICULTURE – Methane and nitrous oxide, two potent greenhouse gases, are emitted from livestock, manure, soil, and synthetic fertilizer management.
- LANDFILLS – Methane and carbon dioxide are released as organic waste (paper, food, wood, etc.) decomposes in landfills without oxygen;
- REFRIGERANTS AND INDUSTRIAL CHEMICALS – Extremely potent greenhouse gases including hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆) are used and emitted in a variety of products and industrial processes.

[Possibly add a pie-chart graphic visualize this]

¹⁷ Halls, Chris, et al. [Living Planet Report 2006](#) (Gland, Switzerland: World Wildlife Fund International 2006)

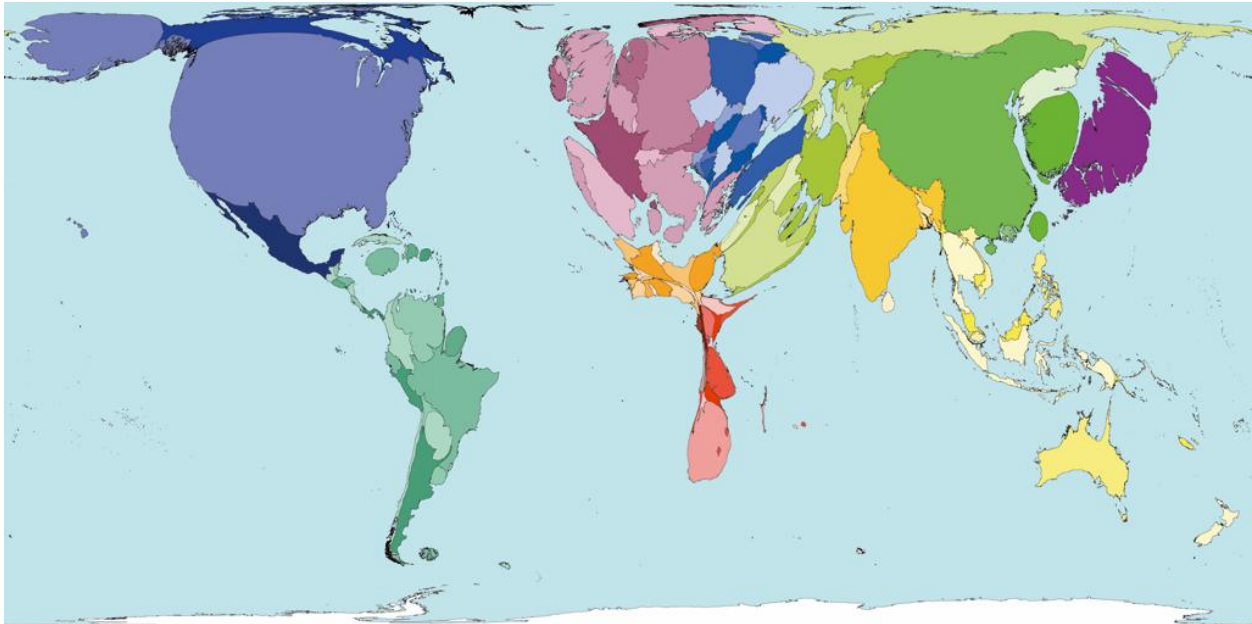


Figure 9: Territory size shows proportion of all GHG emissions from each country¹⁸

A vast body of extensively peer-reviewed research indicates that our actions as a global civilization have become the primary driver of climate change and global warming¹⁹. If we do not change our present course, the scientific community overwhelmingly agrees that the Earth’s response will be a nearly ice-free planet, preceded by a period of chaotic weather and shoreline changes. This decade is perhaps the last chance we have of changing course and avoiding a climactic tipping-point²⁰.

Greenhouse Gas Reduction Initiatives

Eleven states have enacted mandatory GHG reduction laws, and 13 others have set voluntary targets. Many more are focusing on energy-efficiency policies as a cost-effective approach to reducing GHG emissions. Although comprehensive Federal greenhouse gas legislation is still uncertain, the US Environmental Protection Agency has begun regulating greenhouse gas emissions under the existing Clean Air Act. These regulations which will begin to go into effect in 2011 establish stricter standards for new vehicles and restrict emissions from power plants and refineries through permits and performance standards. The cost of these regulatory measures will likely be passed on to consumers, who will see increased prices at the pump and on their utility bills. Although it is unlikely that small businesses and

¹⁸ © Copyright 2006 SASI Group (University of Sheffield) and Mark Newman (University of Michigan). Worldmapper, Map #299 <http://www.worldmapper.org/>

¹⁹ Intergovernmental Panel on Climate Change 4th Assessment Report: Climate Change 2007 – Policymaker Summary Section 2. Causes of Change http://www.ipcc.ch/publications_and_data/ar4/syr/en/spms2.html

²⁰ Hansen, James, et al.

local governments will be directly regulated under the current rules, units of government that enact energy policies now will be a step ahead of rising energy costs.

There is no single, 'silver-bullet' solution to the problems associated with climate change, atmospheric greenhouse gas concentrations, or the inefficient use of resources. It takes multiple measures and initiatives, including those at the local level. Many of these strategies are uniquely available to those that have the capacity to influence how energy is generated, transportation and land use patterns, and citizen or constituent behavior.

Reduction Benefits: Economic

Maintaining and improving our quality environmental resources goes hand-in-hand with long-term financial viability and stewardship. Monitoring GHGs in conjunction with finances is one way to quantify progress. Many GHG reduction measures are directly linked to financial savings and economic benefits such as:

- Inter-Departmental Coordination – Departments that work cooperatively, sharing tools and resources, will be more cost effective from a purchasing perspective.
- Reducing Energy & Resource Consumption – From public transportation to electricity use, to waste management, activities that reduce energy and resource consumption have quantifiable financial returns.
- Local Economic Development – For example, a study conducted by the Institute for Local Self Reliance²¹ found that for every 15,000 tons of waste:
 - Landfilling the waste creates 1 job
 - Composting the waste creates 7 jobs
 - Recycling the waste creates 9 jobs.
- Opportunity Costs – Cost avoidance from reducing GHGs makes dollars available for priorities such as economic investments in the community.

Reduction Benefits: Health

Taking action to reduce GHG emissions also improves local health and wellbeing. Decreasing electricity consumption and vehicle miles driven will reduce local and regional criteria air pollutants that negatively affect human health, like sulfur and nitrogen oxides, carbon monoxide, lead, and particulates. These reduction strategies include land use planning that gets people out of their cars, keeps downtowns dense and diverse, and preserves woodlands, farmlands, and open space. This kind of planning:

- Reduces traffic congestion,
- Reduces air and water pollution,

²¹ Institute for Local Self Reliance, *Wealth to Waste Homepage* <http://www.ilsr.org/recycling/>

- Prevents the need for large new infrastructure development, allowing resources to be directed to updating existing infrastructures,
- Minimizes the urban heat island effect,
- Enhances public health,

The bottom line is that many actions taken to reduce GHG emissions result in the preservation and improvement of Kankaska County's environmental health, economic and social wellbeing. These are the same factors that make our community a desirable destination for families, visitors, and businesses.

The first step for many communities in achieving the goals of these agreements is to join the ICLEI Climate Mitigation program.

ICLEI's Program of Action

ICLEI – Local Governments for Sustainability is an international association, founded in 1990, comprised of government organizations that have made a commitment to sustainable development. Targeting a need for capacity building, this organization provides technical consulting and information to share knowledge and support local governments in the implementation of sustainability initiatives.

ICLEI's Climate Mitigation program provides a framework for measuring greenhouse gas emissions and implementing quantifiable measures to reduce GHG emissions. This campaign was developed to reduce GHGs by internationally encouraging local action. To date, over 450 local municipalities have formally joined the campaign worldwide.

The ICLEI's program is structured around five milestones:

- Conduct a baseline emissions inventory and forecast of GHG emissions,
- Adopt an emissions reduction target for a forecast year,
- Develop a Local Action Plan,
- Implement plan strategies, and
- Monitor and verify results.

This management and mitigation process guides municipal governments in adopting policies and implementing quantifiable measures to reduce local greenhouse gas emissions, improve air quality, and enhance community livability and sustainability.

This report represents the completion of the first milestone and provides a recommended target for emissions reduction. By formally adopting an emissions reduction target the County will complete the second milestone and complete the first phase of action.

Milestones three through five happen over a period of years, starting with the development of real strategies to implement changes that will allow the County to achieve its goals and then monitor in comparison with the baseline inventory numbers to see where change is actually taking place.

Appendix B – Methodology Details

Methodology Summary

The first step toward reducing energy expenses and greenhouse gas emissions is to identify baseline levels and sources of emissions, as well as the sectors of government operations that are responsible for the bulk of these emissions. This information is then used to inform the selection of a reduction target and develop a local plan of action. ICLEI an international organization dedicated supporting local governments striving for sustainability, leads the foremost Energy & Climate Mitigation program. This program assists local governments to systematically track energy and waste related activities and cost by providing software and standardized methodology for estimation and reporting emissions.

Software

ICLEI's The Clean Air Climate Protection (CACP) software tracks emissions of greenhouse gases (primarily carbon dioxide, methane, and nitrous oxide) that result from the use of electricity, fuel, and waste disposal. It then reports the greenhouse gases cumulatively in equivalent carbon dioxide emissions²² (CO₂-e). It also translates all energy units into British Thermal Units (BTUs) for comparison of total energy consumption. The software allows local governments to inventory and monitor emissions from governmental operations as well as emissions from community-wide residential, commercial, industrial, and transportation sectors. This comprehensive assessment, however, focuses solely on County government operations.

Inventory Scope

The County government inventory was calculated using the CACP 2009 software and its default calculations, values, and assumptions unless otherwise noted. To set energy and emission reduction targets government operations were inventoried for a specific base year against which all future reduction measures will be compared. For this comprehensive assessment, the base year analyzed was the calendar year 2009. The scope of analysis generally includes all activities²³ that are financially controlled by the County government and reports these emissions scope 1 – direct and scope 2 – indirect emissions. As exceptions, this inventory also includes four activities, employee commuting, reimbursed business travel, solid waste generation, and solid waste recycling that result in or reduce scope 3 – indirect emissions.

Scope 1 – direct emissions are defined as emissions released directly from County-owned facilities and vehicles including fossil fuels burned and refrigerants leaked.

Scope 2 – indirect emissions also occur as the result of energy consumed by County facilities, but the actual emissions are emitted by sources outside the municipality. Impacts resulting from the consumption of purchased electricity, heat, or steam are considered indirect and represent Scope 2.

22 Because different greenhouse gases have different atmospheric warming potentials, total emissions are converted to carbon dioxide equivalents (CO₂-e) to provide a standard unit of measurement.

23 Emissions or activities may be excluded that fall are considered de minimis – emissions from one or more sources, for one or more gases which, when summed, equal less than 5% of the communities total emissions

Scope 3 – indirect emissions represent all indirect emissions not classified under Scope 2. This includes emissions resulting from transportation for government activities in non County-owned vehicles, landfill emissions resulting from solid waste generated at County facilities, and emissions avoided by recycling.

Inventory activity inputs and emissions created by Kalkaska County operations have been categorized by the software into 13 government sectors:

BUILDINGS & FACILITIES – inputs include total electricity, natural gas, propane and any other power or fuel consumed by County facilities resulting in both scope 1 and scope 2 emissions.

VEHICLE FLEET – inputs include total vehicle types and miles traveled or gallons of diesel, gasoline, and other fuels consumed by County owned on-road and off-road vehicles resulting in scope 1 emissions and mileage reimbursed for County staff resulting in scope 3 emissions.

EMPLOYEE COMMUTE – inputs include vehicle types and miles traveled or total gallons of diesel, gasoline, and other fuels consumed by County employees commuting in non-departmental vehicles.

OTHER PROCESS FUGITIVE – inputs include emissions from activities not included in the categories above, which may include fugitive²⁴, land use-change, and product chain life-cycle emissions. For this inventory inputs include direct scope 1 emissions of refrigerants from County facilities as well as weight and composition (i.e. percentages of organic and inorganic materials²⁵) of solid waste generated within the community during the base year of 2006. Additional inputs include the method of solid waste management (e.g. landfill, incineration, composting, open dumping, etc.), and the percentage of methane capture and flaring or recovery for use.

²⁴ Fugitive emissions are typically unintentional releases associated with leaks of refrigerants or fossil fuels during extraction, processing, distribution, or use other than combustion.

²⁵ The quantity and type of organic materials deposited in a landfill will affect the quantity of methane generated within the landfill as the waste decomposes over time.

Other government sectors tracked by the software but not relevant to Kalkaska County operations are:

- STREETLIGHTS & TRAFFIC SIGNALS
- PORT FACILITIES
- AIRPORT FACILITIES
- WATER DELIVERY FACILITIES
- WASTEWATER TREATMENT FACILITIES
- SOLID WASTE FACILITIES
- ELECTRIC POWER FACILITIES
- TRANSIT FLEET
- MOBILE SOURCE REFRIGERANTS

Data Sources

Two types of data are typically required for calculating greenhouse gas emissions

1. A measure of an emission generating activity (e.g. fuel combustion, electricity consumption, or waste generation/decomposition), and
2. An emission factor – an estimate of greenhouse gas emissions released resulting from a unit of that activity being performed. (e.g. 2.8 kg CO₂-e / liter of gasoline combusted)

Activity and emission factor data sources for the key and secondary emission sources included in the Kalkaska County inventory are listed below.

Electricity

Activity: Electricity consumption and cost data for all facilities was exported from the County's Energy Star Portfolio Manager account. This data was originally entered from electric utility bills received by the County Accounting Clerk, Julie Naasko.

Emission Factors: For this inventory it is assumed that the electricity consumed at County facilities is supplied solely from the RFC Michigan regional electricity grid. Electricity supplied to this region is generated from a mix of sources but the majority is supplied from fossil-fuel based power plants. The resultant average emissions per unit electricity supplied for the RFC Michigan region has been tabulated by the US EPA's eGRID program. Emission factors for the year 2005 were the latest figures available at the time of this analysis.

Natural Gas

Activity: Natural gas consumption and cost data for all facilities was exported from the County's Energy Star Portfolio Manager account. This data was originally entered from electric utility bills received by the County Accounting Clerk, Julie Naasko.

Emission Factors: Default CACP software emission factors for natural gas combustion were used.

Vehicle Fleet

Activity: An inventory road vehicle fleet and non-road (construction and landscape) equipment was collected from each Department by the County Accounting Clerk, Julie Naasko and included vehicle-miles traveled by each road vehicle and the average price per gallon paid by each department.

Emission Factors: For the estimate of transportation emissions, default software fuel economy and emission factors for the combustion of gasoline in each vehicle type were used.

Employee Commute

Activity: County employees were surveyed on numbers of days worked, daily commute distance, vehicle type, and carpooling. The respondent averages were then multiplied by the numbers of days worked by part-time and full-time County employees to estimate the total vehicle miles traveled for each commute vehicle type.

Emission Factors: For the estimate of commute transportation emissions, default software fuel consumption and emission factors for the combustion of diesel, gasoline, and other transportation fuels in each vehicle type were used.

Waste

Activity: Actual tonnages of waste and recycling generated at County facilities were not easily obtainable, instead the volumes of waste and recycling generated by County municipal operations were estimated from

- Waste management invoices – including the waste or recycling type, the sizes of containers picked up and number of pickups;
- Facility maintenance staff – accounts of the average % full of containers; and
- US EPA – average volume to weight conversions for solid waste and cardboard.

Emission Factors: Net emissions generation, associated with landfilling solid waste and net emissions reductions associated with recycling were estimated separately from the ICLEI CACP software. Estimated tonnages of each waste type were entered into the US EPA Waste Reduction Model (WARM) to calculate net GHG emissions for each. Default WARM assumptions for methane recovery and waste transportation distances were assumed.

Appendix C – Energy Savings Accounting – Adjusting for Weather

Currently the energy performance of all County facilities included in this inventory is being monitored using the Energy Star Portfolio Manager (ESPM) software. ESPM was developed by the US Environmental Protection Agency and US Department of Energy as a free, web-based facility energy benchmarking and monitoring tool. The tool was established as a simple, easy to use software for the managers of single or multiple commercial and institutional buildings 5000 ft² or larger. ESPM has also been specifically marketed as a powerful tool for local governments in managing their energy usage and costs and realizing significant savings for their communities.

This tool has been used to benchmark over 100,000 buildings nationally and is regularly updated to improve the performance rating system for a broadening selection of building types. Energy Star also provides frequent free online introductory and more advanced trainings on how to use the software and apply it for energy efficiency decision making and funding. Free and effective technical assistance is also available through the Energy Star website.

In early 2010 SEEDS trained the Kalkaska County Accounting Clerk, Julie Naasko, in the basic navigation and use of ESPM. Ms. Naasko then created facility accounts for twelve county facilities, characterized space use, logged each of the utility meters serving each building, entered energy consumption and cost data from utility bills, and lastly provided SEEDS with online access to each facility's ESPM account. With this access SEEDS has been able to review, refine, correct, and verify the facility profiles and energy usage remotely and in collaboration with the County staff.

ESPM provides weather adjustment (also referred to as weather normalization) for total facility energy use so that one can compare changes in energy efficiency from year to year separate from the effects of weather changes year to year. Unfortunately, ESPM does not also adjust energy costs and energy cost savings according to differences in monthly or annual weather.

To complete weather adjusted cost savings analysis, energy use must be normalized against local daily or monthly temperature data. This analysis can be performed using energy analysis software or performed manually using spreadsheet programs such as Microsoft Excel.

Abraxas Energy Inc. provides an excellent introduction to weather normalization²⁶ as well as a summary of available energy analysis software²⁷ that can be used estimating weather adjusted cost savings and/or greenhouse gas emissions.

Typically heating degree days and cooling degree days are used for these analyses. Table 9 lists the heating and cooling degree days specific to the Kalkaska region for the year that may be needed for performing weather normalized comparisons of energy, cost, and greenhouse gas emissions against the 2009 baseline.

²⁶ <http://www.abraxasenergy.com/weather-normalization.php>

²⁷ <http://www.energy-accounting.com/products.php#>

Table 9: Heating and Cooling Degree Days for the Kalkaska Region

Description: Fahrenheit-based heating and cooling degree days for a base temperature of 65F
 Source: www.degreedays.net (using temperature data from www.wunderground.com)
 Accuracy: No problems detected
 Station: Airport: Traverse City, Michigan, US (85.58W,44.74N)
 Station ID: KTVC

| Month starting | HDD | CDD | Month starting | HDD | CDD | Month starting | HDD | CDD |
|----------------|------|-----|----------------|------|-----|----------------|------|-----|
| 1/1/2008 | 1243 | 0 | 1/1/2009 | 1524 | 0 | 1/1/2010 | 1263 | 0 |
| 2/1/2008 | 1288 | 0 | 2/1/2009 | 1157 | 0 | 2/1/2010 | 1138 | 0 |
| 3/1/2008 | 1193 | 0 | 3/1/2009 | 1013 | 1 | 3/1/2010 | 838 | 3 |
| 4/1/2008 | 568 | 15 | 4/1/2009 | 675 | 12 | 4/1/2010 | 517 | 26 |
| 5/1/2008 | 465 | 15 | 5/1/2009 | 404 | 29 | 5/1/2010 | 309 | 86 |
| 6/1/2008 | 109 | 116 | 6/1/2009 | 185 | 118 | 6/1/2010 | 116 | 95 |
| 7/1/2008 | 54 | 194 | 7/1/2009 | 122 | 97 | 7/1/2010 | 30 | 266 |
| 8/1/2008 | 72 | 182 | 8/1/2009 | 104 | 125 | 8/1/2010 | 32 | 271 |
| 9/1/2008 | 175 | 73 | 9/1/2009 | 182 | 80 | 9/1/2010 | 240 | 40 |
| 10/1/2008 | 525 | 14 | 10/1/2009 | 596 | 1 | 10/1/2010 | 468 | 8 |
| 11/1/2008 | 813 | 6 | 11/1/2009 | 687 | 1 | 11/1/2010 | 741 | 0 |
| 12/1/2008 | 1277 | 0 | 12/1/2009 | 1254 | 0 | 12/1/2010 | 1206 | 0 |

Appendix D – ICLEI CACP 2009 – Software Reports

2009 Baseline Emissions by Sector

2009 Baseline Emissions by Sector and Source

2009 Baseline Emissions by Scope

2009 Baseline Emissions Details with Notes