

Baseline Greenhouse Gas Emissions Inventory for Municipal Operations in Urban Kodiak: FY 2007



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Acknowledgments

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Executive Summary:

The adverse consequences of global climate change have already begun to impact Alaska; documented and potential effects on coastal communities include vulnerability to increasingly severe storms and weather patterns, erosion, and the disruption of marine and terrestrial ecosystems and species upon which commercial and subsistence livelihoods depend (Alaska Department of Environmental Conservation 2008).

On September 14, 2007, Governor Sarah Palin officially formed the Alaska Climate Change Sub-Cabinet with Administrative Order No. 238; Governor Palin also signed on as an observer to the Western Climate Initiative (WCI), a collaboration between the Governors of Arizona, California, New Mexico, Oregon and Washington to address regional effects of climate change. In December of 2007, the City of Homer released their Climate Action Plan as a result of their participation in the Cities for Climate Protection Campaign through the international organization, ICLEI – Local Governments for Sustainability. Earlier that year, the Intergovernmental Panel on Climate Change (IPCC) published their fourth Assessment Report (AR4) and Summary Report for Policy Makers. Their findings included an urgent call for global action to reduce greenhouse gas emissions by 50%-80% below 2000 levels by the year 2050, with emissions peaking no later than 2015 and equivalent CO₂ concentrations stabilizing at 450 parts per million.

The City of Kodiak and the Kodiak Island Borough have joined the growing state and local response to climate change through their membership in ICLEI – Local Governments for Sustainability. In April of 2008, the City Council and Borough Assembly approved the first milestone in the Cities for Climate Protection Campaign: conducting a comprehensive baseline inventory of greenhouse gas emissions for municipal operations in Urban Kodiak. A cooperative agreement between the City, Borough, Alaska Marine Conservation Council, and the University of Alaska, Anchorage, provided a temporary part – time position for a Program Assistant to collect and analyze data on greenhouse gas emissions generated from five different sectors by the Kodiak Island Borough, the City of Kodiak, and the Kodiak Island Borough School District within Urban Kodiak.

This report summarizes the methodology and results of the baseline emissions inventory for fiscal year 2007, including a separate analysis for each jurisdiction. The baseline data has been used to forecast growth and potential emissions for the year 2020 under a “business as usual” scenario; in keeping with policy and science from both the IPCC and ICLEI, this report also provides an analysis of a potential 20% reduction in emissions below baseline levels by the year 2020. Additionally, the Program Assistant has quantified emissions reduced from measures already implemented to decrease energy use since FY 2007, as well as predicted possible reductions from select proposed measures that may be implemented before 2020.

The completion of this first milestone is a leadership initiative and example for the community of Kodiak and provides valuable data against which each jurisdiction might measure their efforts to reduce greenhouse gas emissions. In the event that Municipal Kodiak chooses to set specific policies through a Climate Action Plan, the baseline emissions inventory will form the backbone for future mitigation plans.

A. Reasoning, Methodology & Model

ICLEI's Cities for Climate Protection methodology allows local governments to systematically estimate and track greenhouse gas emissions from energy and waste related activities at the community-wide scale and those resulting directly from municipal operations. The municipal operations inventory is a subset of the community-scale inventory.

Once completed, these inventories provide the basis for creating an emissions forecast and reduction target, and enable the quantification of emissions reductions associated with implemented and proposed measures.

1. CACP Software

To facilitate local government efforts to identify and reduce greenhouse gas emissions, ICLEI developed the Clean Air and Climate Protection (CACP) Software package with Torrie Smith Associates. This software estimates emissions derived from energy consumption and waste generation within a community. The CACP software determines emissions using specific factors (or coefficients) according to the type of fuel used. Emissions are aggregated and reported in terms of equivalent carbon dioxide units, or eCO₂. Converting all emissions to equivalent carbon dioxide units allows for the consideration of different greenhouse gases in comparable terms. For example, methane is twenty-one times more powerful than carbon dioxide in its capacity to trap heat, so the model converts one ton of methane emissions to 21 tons of eCO₂.

The emissions coefficients and methodology employed by the software are consistent with national and international inventory standards established by the Intergovernmental Panel on Climate Change (1996 Revised IPCC Guidelines for the Preparation of National Inventories) and the U.S. Voluntary Greenhouse Gas Reporting Guidelines (EIA form 1605).

The CACP software has been and continues to be used by over 700 U.S. cities and counties to reduce their greenhouse gas emissions. However, it is worth noting that, although the software provides Kodiak with a sophisticated and useful tool, calculating emissions from energy use with precision is difficult. The model depends upon numerous assumptions, and it is limited by the quantity and quality of available data. With this in mind, it is useful to think of any specific number generated by the model as an approximation, rather than an exact value.

The program assistant utilized the data collection forms provided with the CACP software as guidelines to request data from regional energy providers as well as key City, Borough, and School District staff contacts. With the exception of emissions from electricity, all standard CACP emissions coefficients were used in calculating Kodiak's baseline inventory. Methods of generating electric power vary widely throughout Alaska, and the CACP software uses a weighted average to provide a regional "Alaska" Average Grid electricity coefficient. While this coefficient may be more applicable in the larger municipal areas of Alaska, the program assistant chose to work with ICLEI support staff and local provider Kodiak Electric Association to generate a coefficient specific to Kodiak (see Appendix A for resources and discussion regarding data collection and coefficients).

Emissions examined in the inventory were primarily Scope 1 and Scope 2 emissions. Scope 1 emissions are known as "tail pipe" emissions and constitute any release of greenhouse gases as a result of fuel burned on site or in vehicles. Heat for facilities and vehicle fleet fuel usage are examples of Scope 1.

Scope 2 consists of emissions created by the generation of energy off-site, but used locally. All electricity produced by Kodiak Electric Association that is purchased by government entities in Kodiak fall under Scope 2 emissions. There is a Scope 3 category for emissions, but most carbon inventories have limited methods to account for these emissions. Examples of Scope 3 emissions would be fuel used by regional transportation that supplies local government, such as equipment or office supplies shipped by barge. Air commutes for local government business would also constitute Scope 3. At this time, ICLEI CACP software addresses Scope 3 emissions only through an inventory of the waste generated by government operations.

2. Inventory Sources and Process

The creation of an emissions inventory required the collection of information from a variety of sectors and sources. These data were entered into the software to create a municipal emissions inventory. While the software allows for both a community and municipal inventory, the local government of Kodiak decided to pursue only a municipal inventory at this time. The municipal inventory is a subset of the community inventory, and includes energy use and emissions derived from internal government operations, as well as emissions from facilities “owned but not operated” by local government. In order to define the scope of the inventory, Kodiak Island Borough and the City of Kodiak agreed to limit emissions sources included to a geographic area identified as “Urban Kodiak.” This area is defined by a southern perimeter of Gibson’s Cove and extends north to the end of the road system in Monashka Bay, excluding the communities of Bell’s Flats, Chiniak, and the remote villages of Kodiak Island (see Appendix B for an approximate map of Urban Kodiak).

There are two main reasons for completing separate emissions inventories for community and municipal operations. First, the government is committed to action on climate change, and has a higher degree of control to achieve reductions in its own municipal emissions than those created by the community at large. Second, by proactively reducing emissions generated by our own activities, the local government of Kodiak takes a visible leadership role in the effort to address climate change. This is important for inspiring local action in Kodiak, as well as for inspiring other communities.

The municipal operations inventory is based on State Fiscal Year 2007, a time period of July 1, 2006 to June 30, 2007. In order to comply with future ICLEI protocol standards (currently in draft form), it is advisable to use a calendar year for conducting a baseline inventory.

B. Inventory Results

1. Municipal Operations Emissions Inventory Summary

In the base year of FY 2007, Kodiak’s municipal operations generated 10,658 tons of eCO₂. Facilities account for the majority of emissions; the municipal vehicle fleet and the City of Kodiak’s sewer and water operations are the second largest contributors. Table 1 and Figure 1 summarize the aggregate emissions by sector for the combined jurisdictions of City, Borough, and Kodiak Island Borough School District for the geographic area of Urban Kodiak.

Table 1: Kodiak Municipal Emissions Summary

Sector	Equiv CO ₂ (tons)	Energy (million Btu)	Cost (\$)
Buildings	8,202	109,776	\$3,123,304.00
Vehicle Fleet	1,102	12,785	\$284,473.00
Streetlights	182	2873	\$213,670.00
Water/Sewage	1,063	15,874	\$717,515.00
Waste	109	n/a	n/a
TOTAL	10,658	141,308	\$4,338,962.00

Source: CACP Model output

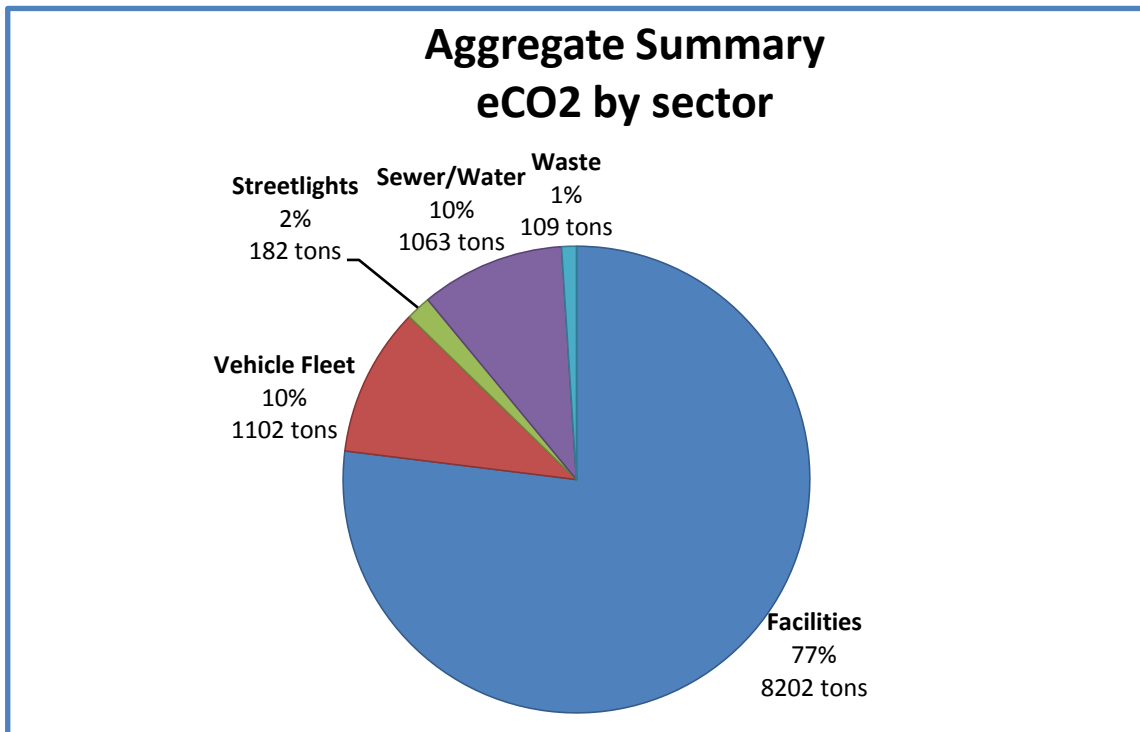


Figure 1: Kodiak Municipal Greenhouse Gas Emissions – FY 2007

Source: CACP Model output

Table 2 and Figure 2 summarize each jurisdiction’s contribution by sector to the total emissions baseline:

Table 2: Tons of eCO₂ emitted by Sector and Jurisdiction

Sector	City	Borough	KIBSD
Facilities	1599	2993	3609
Vehicle Fleet	639	187	276
Streetlights	154	5	24
Water/ Sewer	1063	0	0
Waste	35	12	61

Source: CACP Model output

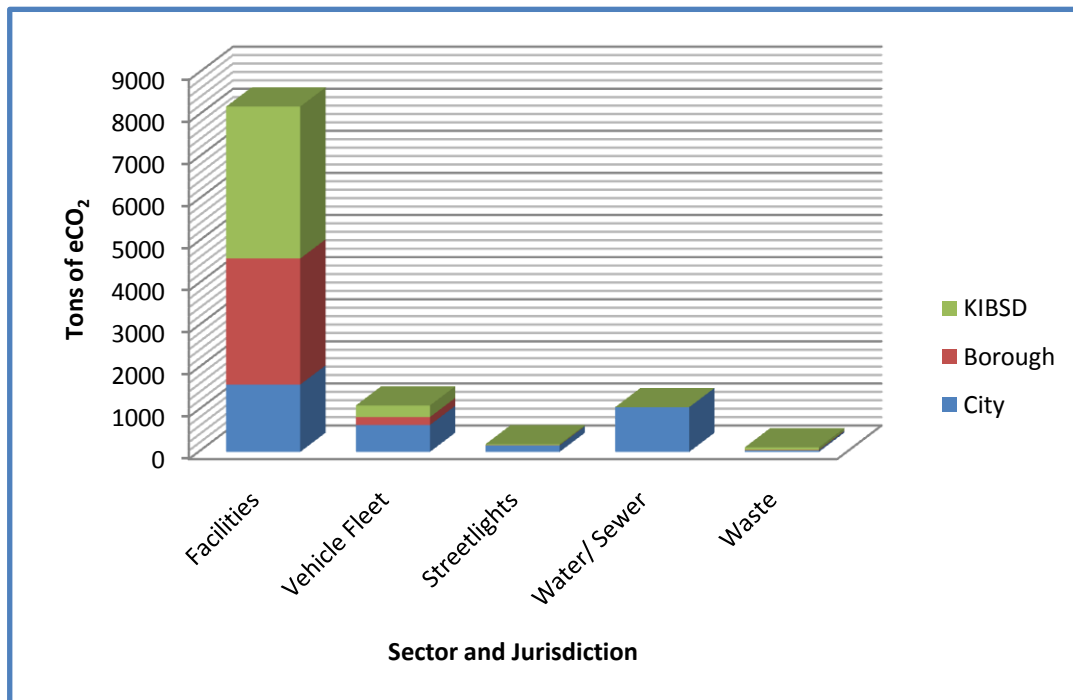


Figure 2: Tons of eCO₂ emitted by Sector and Jurisdiction

Source: CACP Model output

Local government emissions typically fall between 2 to 5 percent of overall community emissions. As a minor contributor to total emissions, actions to reduce municipal energy use may have a limited impact on Kodiak’s overall community emissions levels. However, municipal action has symbolic value and demonstrates leadership that extends beyond the magnitude of emissions actually reduced.

2. Analysis of emissions by jurisdiction

a. City of Kodiak

The City of Kodiak emissions totaled 3490 tons of eCO₂ for FY 2007. Table 3a and Figure 3b summarize emissions results by sector for the City. See appendix C for detailed reports for all jurisdictions.

Table 3a: City of Kodiak eCO₂ emissions for FY 2007

Sector	Equiv CO ₂ (tons)	Energy (MMBtu)	Cost (\$)
<i>Facilities</i>	619	8258	\$220,982.00
<i>Harbor</i>	893	13556	\$609,145.00
<i>Owned but not Operated</i>	87	1132	\$29,217.00
<i>Vehicle Fleet</i>	639	7431	\$168,869.00
<i>Streetlights</i>	154	2430	\$201,310.00
<i>Sewer/Water</i>	1063	15874	\$717,515.00
<i>Waste Estimate</i>	35	n/a	n/a
Total	3490	48681	\$1,947,038.00

Source: CACP Model output

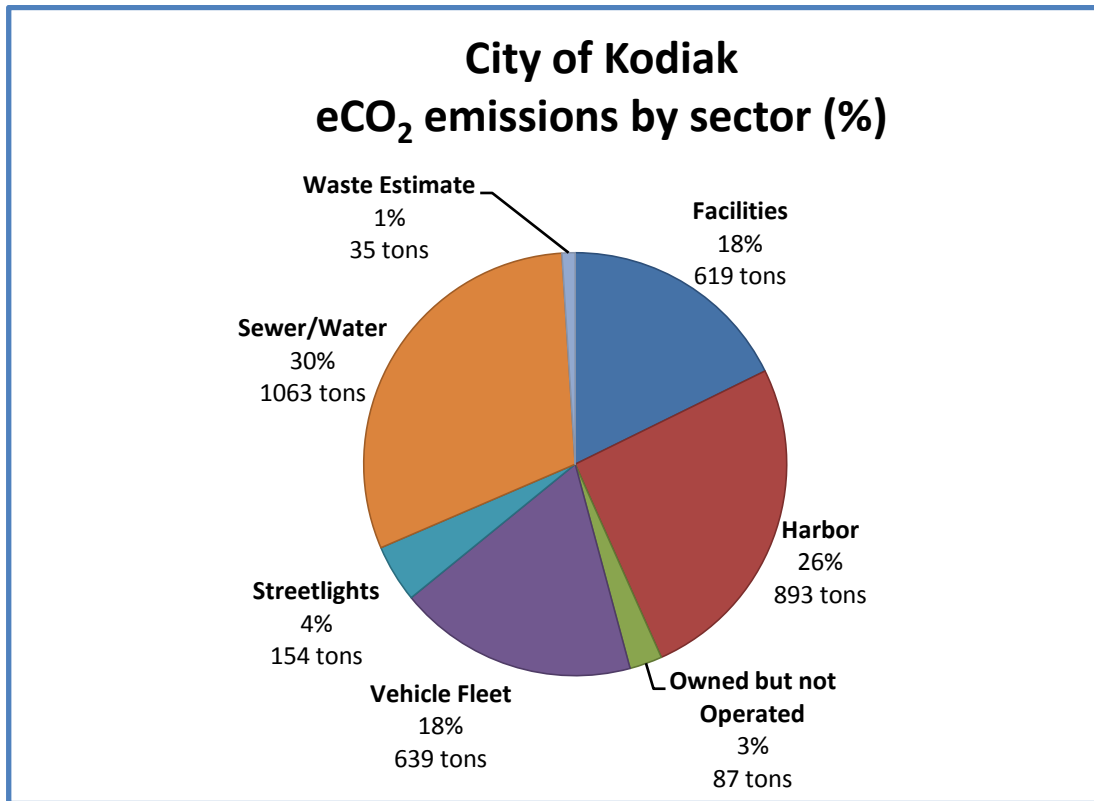


Figure 3a: City of Kodiak eCO₂ emissions for FY 2007

Source: CACP Model output

Energy/Stationary Source Emissions

Facilities: This sector includes all buildings owned and operated by the City of Kodiak. The Police Station and the Public Works Department main building emit the most eCO₂, at approximately 129 tons each. In terms of eCO₂ emissions and energy use per 1000 square feet, these are also among the most inefficient facilities; department contacts have noted that these buildings are old and obsolete and have been modified for increased use beyond their original capacity. The Chichenoff Ice Rink and Fire Station are also major contributors to emissions, and the Fire Station likewise has a low efficiency per 1000 square feet (see appendix C for efficiency per 1000 square feet details).

Harbor: Though emissions from the Harbor and Owned but not Operated sectors are calculated in the CACP software as part of the Facilities sector (and are included in the above aggregate graphs as “Facilities”), they are shown separately here to reflect that their emissions are largely due to community use, rather than municipal operation. The primary source of energy use attributed to the Harbor includes all electrical master meters that supply power to individual boats while they are in port at either St. Paul or St. Herman Harbors. The cost of electricity is passed on to the public consumers; regulations regarding energy reduction measures for Harbor emissions would most likely be a community initiative. The largest source of Harbor emissions are the St. Herman Harbor master meters and the Pier 2 maintenance shop. By comparison, St. Paul Harbor uses relatively little electric power. The City does own and maintain the meters distributing Harbor electricity, and has chosen to claim all emissions as part of their municipal inventory. The Harbormaster’s office and Fisherman’s Hall are included in the St. Paul Master Meter #1; it is difficult to evaluate building efficiency by square foot analysis without a separate account for these facilities.

Owned but not Operated: This sector represents facilities that are owned by the City of Kodiak but are occupied and operated by community entities, all of whom pay their own utility bills: the Animal Shelter, the Baranof Museum, the Chamber of Commerce, and the Kodiak Head Start building. These are all minimal emissions sources.

Streetlights: Streetlights account for a relatively small emissions source, and the City of Kodiak operates the majority of streetlights measured in this inventory. Also included in this sector are the Christmas lights provided by the City in the downtown area; though the electricity is donated, the usage has still been included in the baseline report.

Sewer and Water:

The Sewer and Water sector accounts for the largest emissions contribution by the City of Kodiak. The Spruce Cape Sewage Plant and the Monashka Creek Water Pump Station are the major sources of emissions for this sector, both using a large amount of electricity for their operations.

Transportation Emissions

The Public Works Department provided data for the entire City of Kodiak vehicle fleet, based on gallons of fuel obtained for each vehicle from the Public Works central fuel tanks. The total emissions of the fleet are only slightly more than the amount of eCO₂ generated by facilities, just 18% of overall City emissions. Heavy vehicles in the Public Works Department accounted for the most significant source at 308 tons of eCO₂, with the Police Department fleet the second highest emissions source at 172 tons of eCO₂. It is important to note that the amount of work hours, and thus fuel burned, for the Public Works heavy vehicles varies significantly from year to year depending on the need for snow removal; FY 2007 was a relatively high demand year for snow removal in Kodiak.¹

Solid Waste Emissions

Unfortunately, there is no current system to track tons of waste contributed to the landfill by municipal government. In lieu of concrete data, waste generated by the City of Kodiak was estimated using a common model of .59 tons/employee/year.² Other possible sources not included in this model are: public dumpsters and yard/construction waste from the Departments of Public Works and Parks and Recreation. These Departments do not track their waste tonnage, but they estimate that most of their waste stream is recycled locally and does not contribute a significant volume to the landfill. Composition of waste was estimated at approximately 56% organic waste using Solid Waste Composition report from the *Kodiak Island Borough Solid Waste Management Plan* (2008). Waste is a relatively insignificant emissions source for the City of Kodiak, and reduction measures such as methane capture are not likely to be efficient for a landfill of this small size. See Appendix C for waste estimates data.

¹ “Heavy Vehicles” are defined as trucks with a gross vehicle weight over 8,500 lbs. Public Works estimates that high snow removal years typically result in about 5000 work hours, whereas low snow removal years are about 3000 work hours.

² This model was also used in the Homer baseline inventory, and was recommended by ICLEI. More details about this estimate are available in the appendix.

b. Kodiak Island Borough

Kodiak Island Borough emissions for the geographic area of Urban Kodiak totaled 3,197 tons of eCO₂ for FY 2007. Table 3b and Figure 3b summarize emissions information by sector for the Borough. See appendix C for detailed reports for all jurisdictions.

Table 3b: Kodiak Island Borough eCO₂ emissions for FY 2007.

Sector	Equiv CO ₂ (tons)	Energy (MMBtu)	Cost (\$)
<i>Facilities</i>	1399	17999	\$399,054.00
<i>Owned but not Operated</i>	1594	21220	\$589,610.00
<i>Vehicle Fleet</i>	187	2156	\$41,099.00
<i>Streetlights</i>	5	73	\$7,654.00
<i>Waste</i>	12	n/a	n/a
Total	3197	41448	\$1,037,417.00

Source: CACP Model output

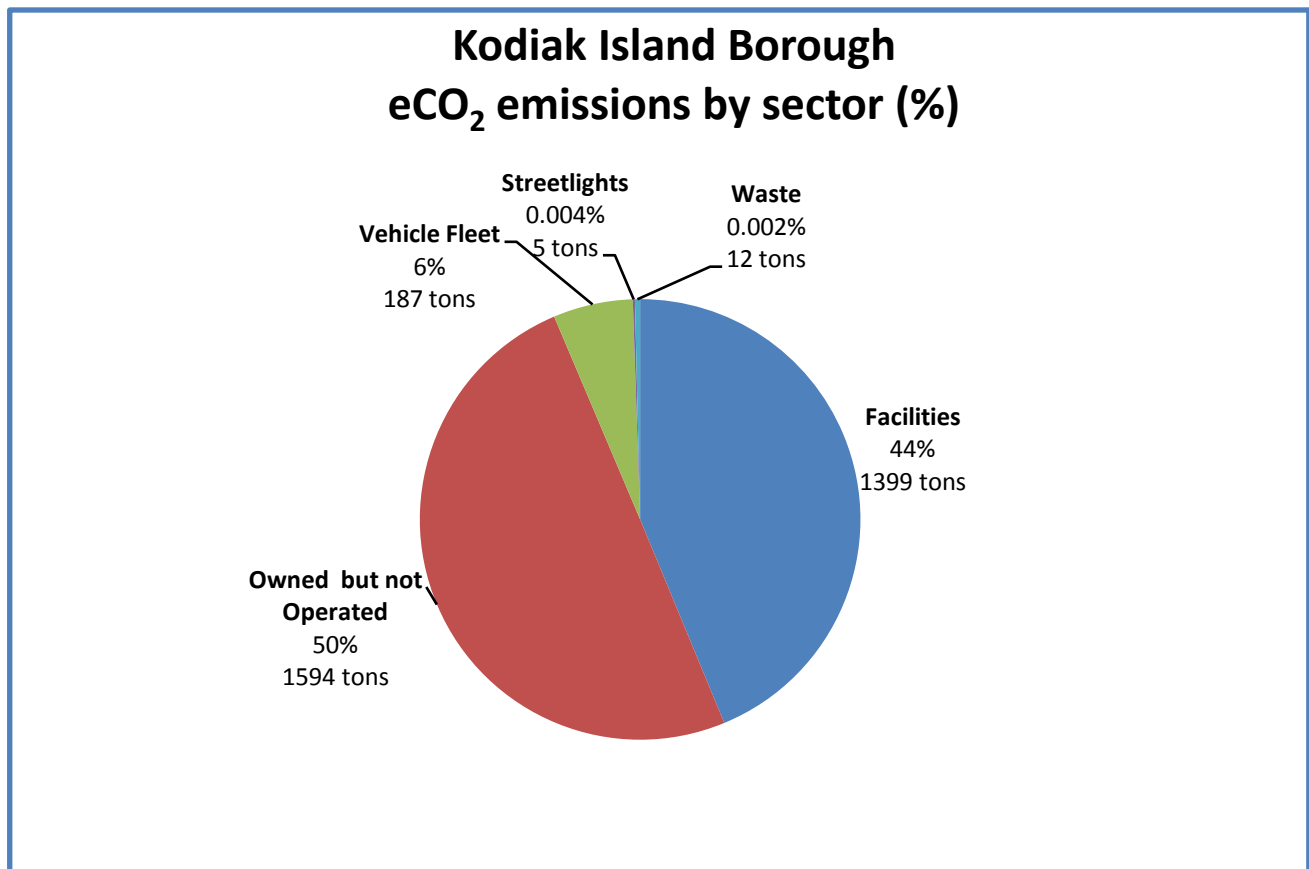


Figure 3b: Island Borough eCO₂ emissions for FY 2007

Source: CACP Model output

Energy/Stationary Source Emissions

Facilities: This sector includes all buildings owned and operated by Kodiak Island Borough within the Urban Kodiak area, and accounts for nearly half of the Borough eCO₂ emissions. The Near Island Fisheries Research facility is the largest emissions source by far at 794 tons of eCO₂, with the Borough Administration Building (303 tons) and the Baler facility at the landfill (156 tons) as other major sources. The Fisheries Research facility is also one of the least efficient buildings in terms of energy use and eCO₂ emissions per 1000 square feet, at well over double the average for facilities of all jurisdictions.

Owned but not Operated: This sector includes two facilities that are owned by the Borough, but operated by another entity: Providence Medical Center and Providence Mental Health Apartments. Providence Medical Center is the major source of emissions, at 1,450 tons of eCO₂ emitted in FY 2007, more than the combined emissions of all Borough facilities measured. The Borough does not pay for utilities used at these facilities, but they are included under Borough ownership and policies in the inventory of emissions for municipal operations.

Transportation Emissions

The Borough vehicle fleet is a relatively small source of emissions at only 187 tons of eCO₂. Of the fleet, the Bayside Fire Department and Borough Administration vehicles are minimal; the equipment used at the Baler facility and landfill account for the majority of emissions, mostly from diesel fuel used in heavy equipment. At the time of inventory, there was no electronic method to track either vehicle miles traveled or gallons of fuel purchased; emissions were estimated using reports generated from the finance department that logged the amount each vehicle paid for fuel over FY 2007.

Solid Waste Emissions

As with the City of Kodiak waste estimate, there is no current system to track tons of waste contributed to the landfill by municipal government. In lieu of concrete data, waste generated by the Borough was estimated using a common model of .59 tons/employee/year.³ Composition of waste was estimated at approximately 56% organic waste using Solid Waste Composition report from the *Kodiak Island Borough Solid Waste Management Plan (2008)*.

c. Kodiak Island Borough School District

Kodiak Island Borough School District (KIBSD) emissions for the geographic area of Urban Kodiak totaled 3,970 tons of eCO₂ for FY 2007. Table 3c and Figure 3c summarize emissions information by sector for KIBSD. See appendix C for detailed reports for all jurisdictions.

Table 3c: Kodiak Island Borough School District eCO₂ emissions for FY 2007

Source	Equiv CO ₂ (tons)	Energy (MMBtu)	Cost (\$)
<i>Facilities</i>	3609	47612	\$1,275,296.00
<i>Vehicle Fleet</i>	276	3198	\$74,505.00
<i>Streetlights</i>	24	370	\$4,706.00
<i>Waste</i>	61	n/a	n/a
Total	3970	51180	\$1,354,507.00

Source: CACP Model output

³ This model was also used in the Homer baseline inventory, and was recommended by ICLEI. More details about this estimate are available in the appendix.

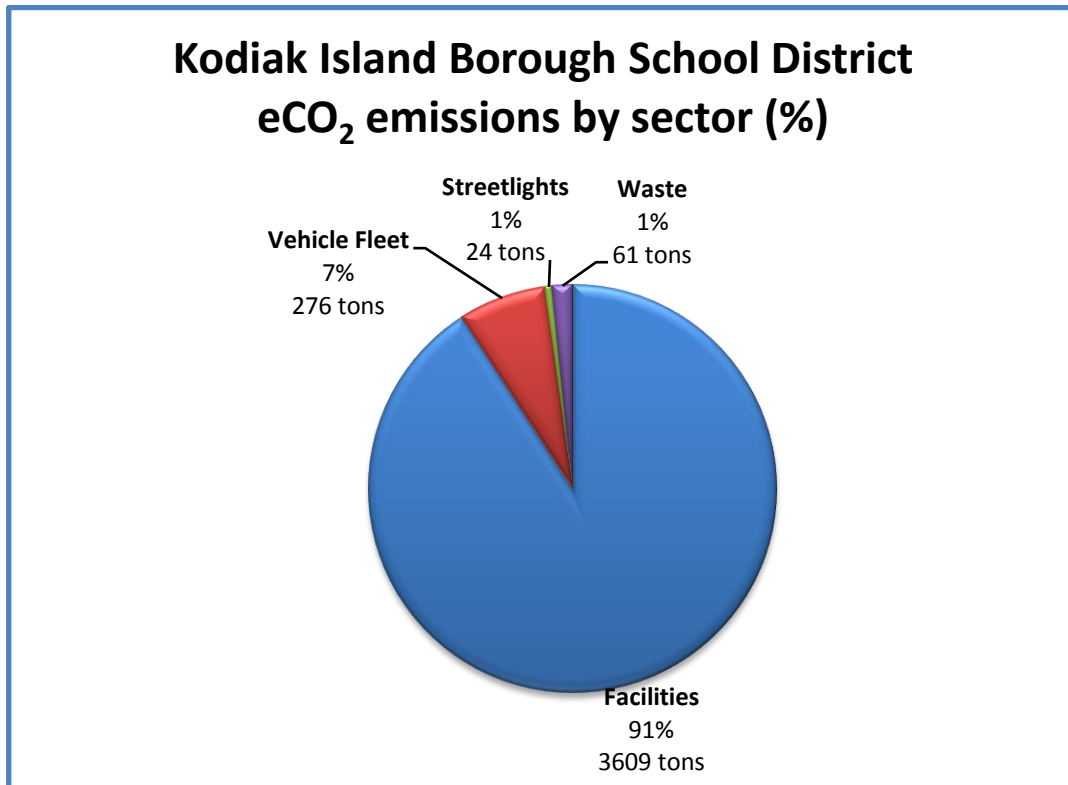


Figure 3c: Kodiak Island Borough School District eCO₂ emissions for FY 2007

Source: CACP Model output

Energy/Stationary Source Emissions

Facilities: Buildings included in the inventory for KIBSD are: East, Main, and North Star Elementary Schools, Kodiak Middle School, Kodiak High School Complex, the Business Complex, and the Rural Schools Office. The Kodiak High School Complex includes the High School, Vocational Building, Swimming Pool, and Auditorium, and is the major source of emissions at 2,022 tons of eCO₂. The Middle School (553 tons) and East Elementary School (349 tons) are the other two largest emissions sources for KIBSD.

Transportation:

Vehicle fleet data for KIBSD included 11 vehicles that were a minimal emissions source at 50 tons of eCO₂. Only one of these vehicles was less than 10 years old. Emissions from contracted school bus services accounted for the major source of eCO₂ at 226 tons; fuel used for the Chiniak route was not included in this inventory.

Solid Waste Emissions

As with the City and Borough waste estimates, there is no current system to track tons of waste contributed to the landfill by KIBSD. In lieu of concrete data, waste generated by the Borough was estimated using a common model of 0.6 lbs/person/day for 175 school days.⁴ Composition of waste was estimated at approximately 56% organic material using Solid Waste Composition report from the *Kodiak Island Borough Solid Waste Management Plan* (2008).

⁴ This model was recommended by ICLEI. More details about this estimate are available in the appendix.

C. Forecast for Greenhouse Gas Emissions

Based on the municipal operations emissions inventories developed for Kodiak for the baseline FY 2007, our next step was to forecast future emissions generated by local government. The emissions forecast represents a business-as-usual prediction of how greenhouse gas (GHG) emissions may change over time.

Forecasts tend to project growth between 10 and 20 years in the future. Usually, forecast years are chosen to coincide with other strategic plans; while there was no specific indication for a forecast year in terms of municipal Kodiak planning documents, several factors supported 2020 as a viable year. 2020 happens to be the latest year available in the current CACP software in which coefficients exist for emissions analysis. The Community Advisory Team discussed the possibility of using a “back-cast” technique to shift baseline data back to the year 2000, providing a 20 year time period between baseline and forecast; however, the team determined that the loss of data integrity through this process would outweigh any potential benefits. The baseline year remains at FY 2007; setting a target year of 2020 gives the longest time period available in which to set reduction goals. Kodiak Electric Association has also set 2020 as the target year to achieve 95% renewable energy in the Kodiak electric grid.

Unfortunately, there is no set protocol provided by ICLEI for calculating government forecast emissions. While community forecast estimates are usually a factor of expected population growth, a similar model does not exist for government activities; however, government growth is usually assumed to be at a lower rate than community growth. The community of Kodiak will likely not experience significant population growth; Alaska Department of Labor forecasts between 0.17% and 0.19% growth for the Kodiak Island Borough between the years of 2008 and 2018 (Bell and Associates, Inc. 2008). Likewise, Borough and City staff do not estimate any significant growth for government in terms of increased employee numbers or additions to the current vehicle fleet. The only sector with significant growth will be the Facilities sector; the addition of a new treatment plant to the Sewer / Water sector has been estimated using the same methodology as estimates for the Facilities sector.

In order to create a rough estimate of a forecast under a “business as usual” scenario, proposed new buildings and their increase in area were used as multipliers against the baseline data. For instance, a new Police Station for the City of Kodiak that will be approximately 3 times the size of the former station would also presumably use 3 times the energy of the current facility estimated in this inventory under a “business as usual” scenario. In order to comply with standard ICLEI protocol for creating this forecast, estimates do not take into account that the Police Station will likely be constructed using LEED standards and will be much more energy efficient than the old building. Instead, the possible energy savings from replacing old infrastructure with higher efficiency buildings is quantified in the Potential Measures section of this report.

When available, the Program Assistant used actual estimated energy data for new infrastructure, such as the new UV Water Treatment Plant that will use approximately 30% more energy than the basic Treatment Plant that it will eventually supplement in 2011 (see appendix D for a further explanation of data used in creating the 2020 forecast). Table 4 shows a comparison of baseline emissions compared to estimated increases in energy use under a “business as usual” scenario for both the City and Borough (KIBSD is included in the Borough for the purpose of forecasting).

Table 4: Forecasted Emissions Summary in “Business as Usual Scenario”

Jurisdiction	Baseline eCO ₂ Emissions in tons (FY 2007)	Forecast eCO ₂ Emissions in tons (2020)	% Annual Increase ⁵
City of Kodiak	3490	4553	2.2%
Kodiak Borough & KIBSD	7167	7518	0.4%

Source CACP Model Output

The estimates given in Table 4 should be viewed as a very rough snapshot of possible CO₂ emission increases by the year 2020; no attempt was made to estimate future costs associated with increased energy use. Likewise, no attempt was made to collect data on future energy increases for those facilities inventoried as “Owned but not Operated,” such as the Providence Medical Center. While the increase in emissions for the City of Kodiak appears higher than expected, the increase in square footage for the new buildings planned will most likely be compensated by a policy of energy efficiency and LEED standard architecture, essentially replacing old and obsolete structures with much-needed larger but more efficient facilities (see Section E for more discussion on energy saving measures). The only completely new facility with a known high energy requirement for operations is the new UV Water Treatment Plant; although new technology will be implemented, the large amount of electricity required for the treatment procedure would not be affected by increased efficiency in building standards.

⁵ % annual increase refers to the amount of change per year expected between 2007 and 2020.

D. Greenhouse Gas Emissions Reduction Target

A reduction target provides a tangible goal for municipal Kodiak’s emissions reduction efforts. The emissions reduction target represents a percentage by which each jurisdiction aims to decrease emissions, below the FY 2007 baseline, by a target year.

For the purpose of this report, a hard reduction target has not yet been set. The Program Assistant conducting the baseline inventory met routinely with a Community Advisory Team, with the understanding that the Team would provide recommendations to the local Kodiak government regarding a possible target reduction. Many factors were considered when selecting Kodiak’s reduction target. We strove to suggest a target that is both aggressive and achievable given local circumstances. Several policies currently in place by individual jurisdictions, including mandates to reduce energy usage, improved maintenance and tracking programs, and higher efficiency building standards will enable municipal Kodiak to immediately work towards this goal.

The Kyoto Protocol target of 7% below 1990 levels was the target the United States agreed to in principal at the 1997 United Nations Council of Parties meeting, but has yet to ratify in Congress. Several European nations set similar goals and some have begun action towards meeting them. IPCC research suggests that we would need to achieve as much as an 80% reduction below 1990 levels in order to reverse global warming and stabilize the climate. Participating ICLEI communities have, on average, chosen between 10 and 20 percent reduction over 10-20 years. In Homer, the first Alaskan community to pursue the ICLEI methodology, a 20% reduction of government emissions by 2020 was adopted by the Homer City Council.

Local factors considered in selecting the target reduction percentage include estimation of the effects of implemented and planned programs and policies, an approximate assessment of future opportunities to reduce emissions, targets adopted by peer communities, and outside factors from regional energy providers that may contribute to reducing emissions. More discussion regarding these factors can be found in Section E. The Community Advisory Team, after reviewing the baseline data and local factors, give a preliminary recommendation of 20% reduction of local government eCO₂ emissions by the year 2020. Table 5 shows effects of a 20% reduction from FY 2007 baseline emissions levels, with an average annual and total reduction of eCO₂ tons by the year 2020.

Table 5: Estimated Reduction Targets for Municipal Kodiak

Jurisdiction	Baseline eCO ₂ Emissions in tons (FY 2007)	Forecast eCO ₂ Emissions in tons (2020)	20% Reduction from Baseline in tons	Annual Reduction needed in tons	Total Reduction in tons
City of Kodiak	3490	4553	2792	135	1761
Kodiak Borough & KIBSD	7167	7518	5734	137	1784

Source: CACP Model Output

Quantifying baseline and forecasted emissions, in addition to setting a reduction target, enables local government to measure specific energy reduction strategies against their selected goal. Some reduction

measures have already been implemented since FY 2007; Section V lists and quantifies some of these measures, in order to evaluate and demonstrate their impact on reducing overall emissions.

E. Existing and Potential Reduction Measures

Kodiak local government has already undertaken a number of municipal operations measures resulting in reduced greenhouse gas emissions relative to the base year of FY 2007. These measures are an excellent first step towards significant reductions of greenhouse gas emissions from municipal operations. According to estimates produced using the CACP software, these measures already account for 215 tons eCO₂ reduction, or 6 percent towards Kodiak’s ultimate municipal operations reduction goal.

1. City of Kodiak

Table 6 represents estimates of energy reduction already implemented by the City of Kodiak since FY 2007. These estimates have been derived both from actual data and from general averages provided by the Climate and Air Pollution Planning Assistant (CAPPA), a preview software program developed through ICLEI (see appendix E for full table and notes). Using baseline data and cost information, these measures reduced eCO₂ emissions by approximately 152 tons, and have a potential cost savings of nearly \$65,000.00 relative to FY 2007 costs.

Table 6: City of Kodiak Estimated Reduction from Implemented Measures since FY 2007

Measure Description	% Reduction	eCO₂ tons Reduced
Kodiak Fire Department new boiler / reduced usage	30%	22
Kodiak Fire Department lighting upgrade: T8 Ballasts	30%	3
Public Works boiler efficiency adjustment	30%	29
Harbor Building temperature sensor for boiler	10%	3
Public Works Leak Correlator	11%	59
Parks and Recreation LED Christmas Lights	78%	4
Kodiak Police Department vehicle downsize: 4 vehicles	38%	32
Total Reductions FY 2007 - Present		152

In addition to these quantified measures, the City of Kodiak has numerous policies that should result in energy savings but are difficult to calculate without detailed tracking data. These include:

- Turning off lights when a room is unoccupied
- Discouraged unnecessary idling of vehicle fleet
- Turning off computer equipment when not in use

Policies that will influence future reductions include:

- Continued downsizing of vehicle fleet when possible to higher efficiency vehicles
- New facilities built to high energy efficiency standards such as LEED
- Installation of conservation technology such as IR sensors for light switches and temperature sensors for boilers

For instance, if all facilities forecast for remodel were built to LEED standards, an estimated 28% reduction of energy use per building would result in 277 tons of eCO₂ reduced from the increased footprint estimated at 975 tons.⁶ Although building the new UV Treatment Plant to LEED standards would likely not reduce the amount of power forecast for operations, other upgrades at the Monashka and Pillar Creek Pumphouses could result in up to 20% savings in the large amount of electricity used for Water / Sewer operations; applied to the Monashka Pumphouse baseline data, this reduces 97 tons of eCO₂ emissions.

2. Kodiak Island Borough and KIBSD

Table 7 represents estimates of energy reduction already implemented by KIBSD since FY 2007. These estimates have been derived from general averages provided by the Climate and Air Pollution Planning Assistant (CAPPA), a preview software program developed through ICLEI (see appendix E for full table and notes). Using baseline data and cost information, these measures reduced eCO₂ emissions by approximately 59 tons, and have a potential cost savings of over \$13,000.00 relative to FY 2007 costs.

Table 7: KIBSD Estimated Reduction through Implemented Measures since FY 2007

Measure Description	% Reduction	Tons eCO ₂ Reduced
East Elementary HVAC upgrade	15%	40
Middle School new insulated roof	5%	19
Total Reductions FY 2007-Present		59

Although the Borough had few measures implemented since FY 2007 that could be quantified, proposed facility maintenance can be expected to reduce another 123 tons of eCO₂ in the near future. One exciting program just implemented is a Direct Digital Controls system for the Borough that will affect all new and remodeled buildings. This technology will improve energy conservation in facilities and may reduce usage by 10-15%. The system currently has been implemented at the Near Island Fisheries Research Center, with a potential reduction of 76 tons of eCO₂ (included in the above estimate of 123 tons reduced). If applied to the potential new KHS/Borough Administration complex, this system alone could result in 180 tons of eCO₂ reduced. The Borough has also recently begun a digital preventative maintenance program that will ensure equipment runs at peak efficiency.

Other potential reduction measures might include upgrading the Near Island Research Center's sea water pumps to run according to demand, reducing usage by up to 30%. Due to the high energy demand of the Research Center's operations, efficiency measures such as these would have a major effect on reducing the Borough's eCO₂ emissions. Likewise, increased efficiency for the overall largest emissions source, the KHS complex, could see dramatic reductions in the eCO₂ emissions for municipal Kodiak. For example, if the new complex were built according to LEED standard energy efficiency, a potential 28% savings would result in about 517 tons of eCO₂ reduced. The Borough is currently working on a set of standards that will describe region-specific energy efficiency measures to be included in all new facilities.

⁶ This includes the Library, Police Station, Fire Station, and Public Works Building forecast data. See Appendix D.

3. External Measures to Consider

Kodiak's regional electricity provider, Kodiak Electric Association, has begun work to install three wind turbines to augment their percentage of renewable energy used in power generation. In the next 5 years, it is more than likely that the grid average used in the CACP software to generate baseline data will increase its percentage of renewable energy, decreasing all emissions from electricity usage. If KEA is able to accomplish their goal of 95% renewable energy by 2020, a significant reduction in emissions will result. The CACP software calculates that if all baseline emissions from electricity were evaluated according to this new coefficient, 2,564 tons of eCO₂ would be reduced from the current baseline emissions. This single reduction constitutes about 72.2% of the 3551 tons of eCO₂ that need to be reduced under a 20% target.

Conclusion

Global climate change is an issue of growing concern among communities around the world; some of the adverse effects of climate change are already impacting areas of Alaska, including coastal communities like Kodiak. The most recent science states that immediate action is necessary to mitigate the anthropogenic forcing of climate change through the reduction of greenhouse gas emissions. In a recently released policy document designed to assist the new administration, the Presidential Climate Action Project affirms "one of the most important challenges facing the 44th President – arguably *the* most important challenge – will be to quickly and effectively address the three interrelated problems of climate change, energy stability and national security" (Presidential Climate Action Project 2008). As a meaningful national policy for climate change mitigation has yet to form, states and local municipal governments continue to set an example by conducting their own emissions inventories and addressing local and regional emissions reduction through Climate Action Plans.

The municipality of Kodiak has demonstrated local leadership by completing this first ICLEI milestone of conducting a baseline emissions inventory. The data represented in this report demonstrates that the most significant source of municipal emissions is in the Facilities sector; while several energy reduction measures implemented since the baseline year demonstrate increased facility efficiency, there is great potential for further emissions reduction with the major co-benefit of energy and cost savings. The baseline data, preliminary forecasts, and quantified measures give a foundation for exploring specific reduction strategies should each jurisdiction choose to form a task force and develop a Climate Action Plan⁷. According to a 2005 survey of ICLEI member cities, communities who have developed Climate Action Plans have collectively reduced greenhouse gas emissions by 23 million tons, leading to \$535 million in annual savings.

The challenge of climate change mitigation must be confronted at local, national, and international levels; Kodiak has the opportunity to join other ICLEI members throughout Alaska and the rest of the world in taking the initiative to reduce greenhouse gas emissions.

⁷ Preliminary recommendations by the Community Advisory Team for possible next steps will be available in a separate document and/or presentation to the City Council and Borough Assembly, at which time a potential task force may be discussed.

References

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APPENDICES

A. Data Collection

- i. CACP Data Collection Overview Form*
- ii. Key Contacts*
- iii. Custom Coefficient Data*

B. Geographic Scope

- i. Map of Urban Kodiak*

C. Baseline Emissions Reports for FY 2007

- i. City of Kodiak*
- ii. Kodiak Island Borough*
- iii. Kodiak Island Borough School District*
- iv. Facility Efficiency by 1000 square feet*
- v. Aggregate Summary of Emissions by Energy Source and Sector*
- vi. Data sheet for waste estimates*

D. Forecast data for 2020

- i. City of Kodiak*
- ii. Kodiak Island Borough and KIBSD*

E. Reduction Measures

- i. City of Kodiak*
- ii. Kodiak Island Borough and KIBSD*

A. Data Collection



Municipal Operations Data Sources

This form is intended to assist the **Staff Liaison** with coordinating the data collection process to complete a municipal operations greenhouse gas emissions inventory. Data requirements for the municipal operations emissions inventory are listed below, along with space to identify a particular staff person or other source for each data element. **Please complete and save this form.**

Basic Information

Jurisdiction: _____ **Base Year:** _____

Interim Analysis Year (optional)*: _____ **Forecast Year(s):** _____

*The data needed for any interim analysis years will be identical to that needed for the base year inventory.

Climate Protection Task Force Members

Name	Title	Phone Number	Email Address

Shaded area indicates Staff Liaison/Data Collection Coordinator

Municipal Operations Inventory Data Requirements

Sector	Data Category	Data Requirements	Staff Data Source
Buildings (all municipally managed facilities)	Required Base Year Energy Data	Quantity of each of the following consumed by each facility: <ul style="list-style-type: none"> • Electricity • Natural gas • Other significant fuels 	_____ _____ _____
	Optional Base Year Indicators	<ul style="list-style-type: none"> • Electricity and gas costs per unit consumed • Building area • Hours of operation • Number of staff 	_____ _____ _____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> • Energy consumption • Expected changes in number of staff • Floor area estimates for new buildings 	_____ _____ _____
Streetlights (all outdoor lighting - traffic, street etc)	Required Base Year Energy Data	<ul style="list-style-type: none"> • Electricity consumption 	_____
	Optional Base Year Indicators	<ul style="list-style-type: none"> • Number of streetlights • Electricity costs per unit consumed 	_____ _____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> • Quantity or energy consumption estimates for new streetlights 	_____
Water & Sewage (treatment, pumping)	Required Base Year Energy Data	<ul style="list-style-type: none"> • Energy consumption • Electricity and gas costs per unit consumed 	_____ _____
	Optional Base Year Indicators	<ul style="list-style-type: none"> • Volume of water pumped, treated 	_____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> • Energy consumption and cost estimates for new facilities • Changes in population served 	_____ _____
Vehicle Fleet (all vehicles in municipally managed fleet)	Required Base Year Fleet Data	<ul style="list-style-type: none"> • Fuel consumption per vehicle/vehicle type (<i>may substitute vehicle miles traveled by vehicle type</i>) • Fuel costs by fuel type 	_____ _____
	Optional Base Year Indicators	<ul style="list-style-type: none"> • Number of vehicles in fleet • Distance traveled per vehicle by vehicle type 	_____ _____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> • Fuel consumption and cost estimate for new vehicles 	_____

Waste (generated by municipal operations)	Required Base Year Waste Data	<ul style="list-style-type: none"> Amount of waste generated in the base year Percent composition by major waste type Estimation of methane recovery rate at utilized landfills 	_____
	Optional Base Year Indicators	<ul style="list-style-type: none"> Number of municipal employees 	_____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> Expected change in amount of waste to landfill and composition, or change in number of employees 	_____
Employee Commute (emissions resulting from employees traveling to and from work)	Required Base Year Waste Data	<ul style="list-style-type: none"> Vehicle miles traveled by employees in the base year 	_____
	Optional Base Year Indicators	<ul style="list-style-type: none"> Number of municipal employees 	_____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> Change in number of municipal employees, change in commuting patterns 	_____
Other (emissions not captured in above categories)	Required Base Year Data	<ul style="list-style-type: none"> Absolute emissions generated from sources not captured in above categories 	_____
	Target Year Forecast Indicators	<ul style="list-style-type: none"> Any indicators necessary for forecasting change in emissions by target year 	_____

Note: Virtually all emissions represented in the municipal operations emissions inventory should also included in the community-scale emissions inventory.

ii. List of Contacts

Kodiak Island Borough and KIBSD

Name	Department	Phone	Email
Rick Gifford	Borough Manager	486-9301	rgifford@kodiakak.us
Woody Koning	Director, Facilities & Engineering	486-9343	wkoning@kodiakak.us
Robert Tucker	Maintenance Manager	486-9342	btucker@kodiakak.us
Karleton Short	Finance Director	486-9323	kshort@kodiakak.us
Dria Bray-Halloway	Borough Accountant	486-9323	dholloway@kodiakak.us
Scott Williams	KIBSD Facilities Director	481-6215	Swilliams04@kodiakschools.org
Sandy Dawes	KIBSD Purchasing	481-2283	sdaws01@kodiakschools.org
Stan Thompson	Maintenance Director: Providence Hospital	539-1269	Stan.Thompson@providence.org
Bob Himes	Bayside Fire Department		

City Contacts

Name	Department	Phone	Email
Linda Freed	City Manager	486-8640	lfreed@city.kodiak.ak.us
Mary Munk	Finance Director	486-8600	mmunk@city.kodiak.ak.us
Heather Long	Accounts Payable	486-8656	hlong@city.kodiak.ak.us
Mark Kozak	Public Works Director	486-8060	mkozak@city.kodiak.ak.us
Ian Fulp	Parks and Rec Director	486-8670	ifulp@city.kodiak.ak.us
Genedine Taan	Public Works Clerk	486-8670	gtaan@city.kodiak.ak.us
Kyle Valerio	KPD Lieutenant	486-8000	kvalerio@city.kodiak.ak.us
Dave Billings	KFD Lieutenant	486-8040	dbillings@city.kodiak.ak.us
Lon White	Harbor Operations Mgr		lwhite@city.kodiak.ak.us

Regional Service Providers:

Name	Company	Phone	Email
Alice Job	KEA Director, Administration & Finance	486-7700	ajob@kodiak.coop
Jennifer Richcreek	KEA Env. Outreach Coordinator	486-7700	jrichcreek@kodiak.coop
Jo Ure	KEA Finance Department	486-7700	jure@kodiak.coop
Mark Toskey	Petro Star Inc Director of Supply	339-6639	matoskey@petrostar.com
Jaime Flores	Petro Marine Plant Manager	486-3421	jaimef@harborent.com

iii. Custom Coefficient Data

In building the Municipal Kodiak Baseline Emissions Inventory, we developed two custom coefficient sets under the direction of ICLEI support staff to represent our regional electric grid. The Alaska Regional Grid coefficient provided as a default contains a much higher ratio of non-renewable energy than our local regional provider, and thus would result in higher total emissions.

In consultation with regional provider Kodiak Electric Association, we determined that a ten year average ratio from 1997 to 2007 showed electricity generated from 78% hydroelectric (non-emissions) energy and 22% light fuel oil mix. We also chose to develop a second coefficient set to reflect the projected scenario in which KEA will use 95% renewable sources (wind and hydroelectric) and only 5% light fuel oil by the year 2020. The two coefficient sets are displayed below.

Table iii: Coefficient Data Set for KEA Electric Grid

	Emissions	unit	CO ₂	N ₂ O	CH ₄	NO _x	SO _x	CO	VOC	PM10
KEA FY 2007	tons	GWh	216.25	0.001	0.003	0.324	0.999	0.046	0.004	0.006
KEA 2020	tons	GWh	49.148	0	0.001	0.074	0.227	0.01	0.001	0.001

B. Geographic Scope

i. Approximate map of Urban Kodiak area



Acrobat Document

C. Baseline Emissions Reports for FY 2007

*Note: In the detailed report, percentage of CO2 field indicates percentage of total emissions from the Borough, City, and School District combined. In the summary reports used in the main report, the percentage of CO2 refers to the percentage each sector contributes to that particular jurisdiction.

i. *City of Kodiak Detailed Emissions Report for FY 2007*

Source	Equiv CO ₂ (tons)	Equiv CO ₂ (%)	Energy (MMBtu)	Cost (\$)
Facilities				
112 Yukon St (vacant)	0	0	1	177
Barn (614 Egan Way)	8	0.1	120	4789
Chichenoff Ice Rink	73	0.7	1042	41506
Fire Station	95	0.9	1262	33388
Kodiak Youth Services (now vacant)	7	0.1	94	1969
Library	65	0.6	872	23981
Municipal Airport Electric Gate	0	0	0	193
Parks & Rec Baranof Office	10	0.1	126	3398
Parks and Rec East Addition Park	0	0	4	396
Police Station	129	1.2	1716	47223
Public Works Main Building	129	1.2	1709	44823
Public Works Salt Shed	0	0	7	540
Public Works Warehouse	51	0.5	642	2998
Teen Center (410 Cedar St)	51	0.5	662	15602
Subtotal	619	5.8	8258	220982
Harbor				
733 W Rezanof Pier 2 Extension	6	0.1	97	5146
Dock Light for Oscar Dyson	4	0	60	3262
Dog Bay Master Meter #3	199	1.9	3133	157433
Dog Bay Master Meter #4	160	1.5	2527	128711
Dog Bay Master Meter 1	19	0.2	296	14757
Dog Bay Master Meter 2	136	1.3	2138	108787
Dog Bay Restrooms	8	0.1	99	1592
Oscar Dyson Meter Pier 2	62	0.6	982	56223
Oscar's Dock 2 Slip 1	7	0.1	103	5425
Oscar's Dock 2 Slip 2 Mid	2	0	36	2097
Oscar's Dock 2 Slip 3	6	0.1	94	4984
Oscar's Dock 2 Slip 4	1	0	11	819
Oscar's Dock 2 Slip 5	0	0	6	363
Pier 2 Maintenance Shop and St.	108	1	1344	0
Pier 2 Used Oil Tank Farm	2	0	26	1577
Shelikof St Restrooms	14	0.1	176	2837
Spit Restrooms	2	0	39	2232
St. Paul Harbor Gravel Grid	0	0	0	207
St. Paul Harbor New Grid	2	0	37	2119
St. Paul Master Meter #1 (Harbor Master)	37	0.3	501	14518

St. Paul Master Meter #2 Float	33	0.3	515	25897
St. Paul Master Meter Floats C	85	0.8	1336	69939
Transient Boat Dock	0	0	1	223
Subtotal	893	8.4	13556	609145
Owned but not Operated				
Animal Shelter	13	0.1	172	4900
Baranof Museum	45	0.4	574	11855
Chamber of Commerce	12	0.1	168	5265
Kodiak Head Start Building	17	0.2	218	7197
Subtotal	87	0.8	1132	29217
Vehicle Fleet				
Harbor Vehicles	59	0.6	694	13971
Kodiak Fire Department	33	0.3	386	8288
Kodiak Police Dept.	172	1.6	2012	40536
Parks and Rec	34	0.3	397	9063
Public Works Heavy Vehicles	308	2.9	3549	74893
Public Works Light Vehicles	34	0.3	392	22119
Subtotal	639	6	7431	168869
Streetlights				
(14) 400W HPS Lights	6	0.1	90	7395
(15) 150W HPS Lights	3	0	41	4725
(17) 400W HPS Lgt Mill Bay	7	0.1	109	8980
(18) 175W MV Lights	3	0	43	2953
(2) 100W HPS Lights	0	0	4	499
(2) 150W HPS Carolyn	0	0	5	630
(2) 150W HPS Mylark Ln	0	0	5	630
(2) 150W HPS Woody Way Loop	0	0	5	630
(2)150 W HPS SE Breakwater	0	0	5	630
(20) 150W HPS Lights	3	0	54	5985
(20) 400W HPS Lights	8	0.1	129	10565
(27) 400W HPS Lights	11	0.1	174	14262
(3) 150 Mill Bay/ Murphy	1	0	8	945
(3) 150W HPS Lights	1	0	8	945
(3) 150W HPS Mill Bay	1	0	8	945
(3) 400W HPS Lights	1	0	19	1585
(3) 400W HPS Lights 2	1	0	19	1585
(3) 400W HPS Lights 3	1	0	19	1585
(3) 400W HPS Lts Powell Av	1	0	19	1585
(39) 250W HPS Lts Selief	10	0.1	165	17394
(4) 150W HPS Simeonoff/Chichen	1	0	11	1260
(4) 250W MV Lights	1	0	18	1019

(56) 400W MV Lights	24	0.2	376	21496
(6) 150W HPS Woody Way Loop	1	0	16	1890
(6) Tsunami Alert Sirens	1	0	14	984
(64) 250W HPS Lights	17	0.2	270	28543
(7) 400W HPS Lights	3	0	45	3698
(79) 400W HPS Lights	32	0.3	508	41731
(9)100 W HPS Lights	1	0	18	2247
100W HPS Elder Heights Bonapar	0	0	2	250
100W HPS Selief Bonaparte	0	0	3	315
150 HPS 1317/19 Ismailov	0	0	3	315
150W HP 1718 Selief Ln	0	0	3	315
150W HPS 1115/17 Purtov	0	0	3	315
150W HPS 1119/24 Baranof	0	0	3	315
150W HPS 1211/15 Purtov	0	0	3	315
150W HPS 1219/21 Purtov	0	0	3	315
150W HPS 1220 Baranof Park	0	0	3	315
150W HPS 1225/27 Purtov	0	0	3	315
150W HPS 12th/Baranof	0	0	3	315
150W HPS 1314 Baranof	0	0	3	315
150W HPS 1315 Purtov St	0	0	3	315
150W HPS 1415/19 Baranof	0	0	3	315
150W HPS 1416 Selig St.	0	0	3	315
150W HPS 1423 Simeonoff	0	0	3	315
150W HPS 14th/Ismailov	0	0	3	315
150W HPS 1515/17 Simeonoff	0	0	3	315
150W HPS 1521 Baranof St	0	0	3	315
150W HPS 1522 Selief Ln	0	0	3	315
150W HPS 1613 Simeonoff	0	0	3	315
150W HPS 1614 Selief	0	0	3	315
150W HPS 1620 Selief Ln	0	0	3	315
150W HPS 1712 Selief Ln	0	0	3	315
150W HPS 313 Pine Crescent	0	0	3	315
150W HPS Baranof/Ole Johnson	0	0	3	315
150W HPS Ismailov/13th	0	0	3	315
150W HPS L16 B19 Kodiak	0	0	3	315
150W HPS LT 514 Mission	0	0	3	315
150W HPS Selief/Mozart	0	0	3	315
150W HPS Simeonoff/Ole Johnson	0	0	3	315
150W HPS Yukon St.	0	0	3	315
175W MV 1416 E Kouskov	0	0	7	384
175W MV Mill Bay Airport	0	0	2	164

217 Lower Mill Bay Police Dept	0	0	2	150
2411 Mill Bay Rd Siren	0	0	2	164
250W HPS 1129 Wolkoff	0	0	4	446
400W HPS 102 Natalia	0	0	7	384
400W HPS 11th/Baranof	0	0	6	528
400W HPS Hemlock/Lower Mill Ba	0	0	6	528
400W HPS St Herman EE	0	0	6	528
400W MV 1523 Mission Rd	0	0	7	384
City Christmas Lights	5	0	84	0
Zentner & Ole Johnson 1-1	0	0	3	315
Subtotal	154	1.4	2430	201310
Sewer/Water				
2578 Metrokin Way Lift Station	63	0.6	991	56104
2821 Spruce Cape Sewage Plant	334	3.1	4537	139366
3010 Spruce Cape Pump	3	0	48	2701
315 Seabreeze Lift Station	1	0	19	1238
3565 Sean Circle Lift Station	3	0	47	2663
3880 Woodland Pump Station	1	0	18	1170
4152 Mill Bay Pump Station	24	0.2	360	16387
438 Teal Way Lift Station	1	0	15	1018
511 Marine Way Lift Station	0	0	3	338
518 Mozart Circle Lift Station	4	0	56	3142
Beaver Lake Loop Rd. Lift Stat	1	0	14	952
Cliffside Lift Station	1	0	11	798
Dog Bay Lift Meter	3	0	52	2899
Dog Bay Lift Station	2	0	25	1502
Father Herman Lift Station	25	0.2	393	20946
Harry Nielsen St. Lift Station	1	0	8	659
Larch St. Lift	1	0	15	1024
Monashka Creek Water Pump Stat	489	4.6	7696	394089
Near Elks Bldg Lift Station	4	0	70	3805
Pillar Creek Water Pump Statio	63	0.6	926	41753
Pillar Mt. Chlorinator	36	0.3	525	22135
Shelikof St Lift Station	2	0	28	1643
Sut Larsen Way Lift #2	0	0	8	609
Trident Basin Float Lift	0	0	7	575
Subtotal	1063	10	15874	717515
Waste				
City Estimate	35	0.3	n/a	n/a
Total	3490		48681	1947038

ii. Kodiak Island Borough Detailed Emissions Report for FY 2007

Source	Equiv CO ₂ (tons)	Equiv CO ₂ (%)	Energy (MMBtu)	Cost (\$)
Facilities				
Baler Building	156	1.5	2048	51848
Bayside Fire Department	64	0.6	839	20946
Borough Administration Building	303	2.8	4067	118203
Cottage (720 Egan)	4	0	53	2282
Near Island Research Apartment	67	0.6	853	17709
Near Island Research Facility	794	7.4	9986	184550
Red Cross Building (610 Mill Bay Rd)	12	0.1	152	3517
Subtotal	1399	13.1	17999	399054
Owned but not Operated				
Providence Medical Center	1450	13.6	19365	541615
Providence Mental Health Appts	144	1.4	1855	47995
Subtotal	1594	15	21220	589610
Vehicle Fleet				
Bayside Fire Dept	5	0.1	64	1662
Borough Administration Trucks/	8	0.1	100	2531
Landfill Equipment	173	1.6	1993	36906
Subtotal	187	1.8	2156	41099
Streetlights				
(1) 175W MV Bayside Fire Station	0	0	2	122
3584 Patrick Ct (1) 100W HPS	0	0	0	64
3661 Gull Dr (1) 250W HPS	0	0	1	115
4606 E Rezanof Fire (1) 175W M	0	0	2	150
Anton/North Star (1) 250WHPS	0	0	4	408
Trinity Sub Lighting	1	0	17	1754
Woodland Acres	3	0	46	5041
Subtotal	5	0	73	7654
Waste				
Borough Estimate	12	0.1	n/a	n/a
Total	3197	30	41448	1037417

iii. Kodiak Island Borough School District Detailed Emissions Report for FY 2007

Source	Equiv CO ₂ (tons)	Equiv CO ₂ (%)	Energy (MMBtu)	Cost (\$)
Facilities				
East Elementary School	349	3.3	4617	137939
KIBSD Business Complex	132	1.2	1725	41474
Kodiak High School	2022	19	26479	668393
Kodiak Middle School	553	5.2	7479	225469
Main Elementary School	253	2.4	3344	93602
Northstar Elementary School	294	2.8	3889	106317
Rural School Office (Cottage #	6	0.1	78	2101
Subtotal	3609	33.9	47612	1275296
Vehicle Fleet				
KIBSD Vehicles	50	0.5	589	11522
KIBSD Buses	226	2.1	2609	62983
Subtotal	276	2.6	3198	74505
Streetlights				
123 Powell KIB Freezer Lights	20	0.2	319	1060
East Elementary Ball Field Lig	0	0	6	528
High School Lights	3	0	40	2303
Mill Bay School Zone Lights	0	0	3	368
Powell/Rezanoff School Zone Li	0	0	1	209
Rezanoff/Benny Benson School Z	0	0	1	239
Subtotal	24	0.2	370	4706
Waste				
KIBSD Estimate	61	0.6	n/a	n/a
Total	3970	37.3	51180	1354507

iv. Facility Efficiency by 1000 square feet

Facility		Equiv CO2 (tons)	Energy (MMBtu)	Cost (\$)
Kodiak Island Borough School District				
Kodiak High School	Per 1000 sq. ft.	7.6	98.9	2497.3
Kodiak Middle School	Per 1000 sq. ft.	8.8	119.7	3607.5
East Elementary School	Per 1000 sq. ft.	8.6	113.7	3397.5
Main Elementary School	Per 1000 sq. ft.	7.6	100.5	2813.4
Northstar Elementary School	Per 1000 sq. ft.	7.1	93.9	2568.1
KIBSD Business Complex	Per 1000 sq. ft.	13.5	176.4	4240.7
Rural School Office (Cottage #2)	Per 1000 sq. ft.	7.9	103.6	2801.7
Kodiak Island Borough				
Borough Administration Building	Per 1000 sq. ft.	10.7	143.2	4162.1
Cottage (720 Egan)	Per 1000 sq. ft.	5	70.1	3043.2
Baler Building	Per 1000 sq. ft.	32.4	426.7	10801.6
Bayside Fire Department	Per 1000 sq. ft.	11.9	155.4	3878.9
Near Island Research Facility	Per 1000 sq. ft.	23.9	300.8	5558.7
Near Island Research Apartments	Per 1000 sq. ft.	11.9	152.4	3162.3
Red Cross Building (610 Mill Bay Rd)	Per 1000 sq. ft.	9.1	117	2705.3
City of Kodiak				
Teen Center (410 Cedar St)	Per 1000 sq. ft.	4.8	63	1485.9
Police Station	Per 1000 sq. ft.	18.4	245.1	6746.2
Barn (614 Egan Way)				

	Per 1000 sq. ft.	3.2	46.2	1842
Parks & Rec Baranof Office				
	Per 1000 sq. ft.	6.4	84	2265
Public Works Salt Shed				
	Per 1000 sq. ft.	0.2	3.9	299.9
Public Works Warehouse				
	Per 1000 sq. ft.	15.9	200.7	937
Public Works Main Building				
	Per 1000 sq. ft.	15.5	205.9	5400.3
Baranof Museum				
	Per 1000 sq. ft.	12.5	159.4	3293
Library				
	Per 1000 sq. ft.	6.1	81.5	2241.2
St. Paul Master Meter #1 (HarborMasters)				
	Per 1000 sq. ft.	14.3	192.8	5583.7
Animal Shelter				
	Per 1000 sq. ft.	13.2	172	4899.9
Kodiak Head Start Building				
	Per 1000 sq. ft.	9.3	121.1	3998.5
Fire Station				
	Per 1000 sq. ft.	15.9	210.3	5564.6
Chamber of Commerce				
	Per 1000 sq. ft.	6.9	93.2	2924.8
Sector Average				
	Per 1000 sq. ft.	9.5	124.4	3169.7

v. *Aggregate Summary of Emissions by Energy Source and Sector*

Energy Source and Sector	eCO ₂ (tons)	eCO ₂ (%)	Energy (MMBtu)	Cost (\$)
Facilities Sector				
Kodiak Electric Association Baseline	2334	21.9	36761	\$ 1,950,686.00
Light Fuel Oil	5842	54.8	72662	\$ 1,157,286.00
Propane	26	0.2	354	\$ 15,332.00
<i>Subtotal</i>	8202	76.9	109776	\$ 3,123,304.00
Vehicle Fleet Sector				
Diesel	732	6.9	8442	\$ 181,777.00
Gasoline	369	3.5	4307	\$ 101,107.00
LPG	3	0	35	\$ 1,589.00
<i>Subtotal</i>	1104	10.4	12785	\$ 284,473.00
Streetlights Sector				
Kodiak Electric Association Baseline	182	1.7	2873	\$ 213,670.00
<i>Subtotal</i>	182	1.7	2873	\$ 213,670.00
Water / Sewage Sector				
Kodiak Electric Association Baseline	802	7.5	12636	\$ 665,227.00
Light Fuel Oil	260	2.4	3238	\$ 52,288.00
<i>Subtotal</i>	1063	10	15874	\$ 717,515.00
Waste Sector				
Food Waste	33	0.3		\$ -
Paper Products	80	0.8		\$ -
Plant Debris	-1	0		\$ -
Wood/Textiles	-4	0		\$ -
	109	1		\$ -
Total	10659	100	141307	\$ 4,338,962.00

vi. Datasheet for Baseline Waste Estimates (all jurisdictions)

Jurisdiction	Employees/Students		Waste (lbs)	Waste (tons)
City				
FTE	114		134520	67.26 tons
Borough⁸				
FTE	40		47200	23.6 tons
KIBSD⁹				
	Students	Staff		
Kodiak High School	818	68	93030	
Kodiak Middle School	345	29	39270	
East Elementary	318	28	36330	
Main Elementary	265	25	30450	
North Star Elementary	303	25	34440	
KIBSD total			233520	116.76 tons
Total			415240	or 207.62 tons

⁸ Part time employees were factored into the FTE total number. Government waste estimated by using a model suggested by ICLEI from the California Integrated Waste Management Board (<http://www.ciwmb.ca.gov/WasteChar/WasteGenRates/Institution.htm>):

Government 0.59 tons/emp/year 1990 Environmental Thresholds and Guidelines Manual (Santa Barbara County)

⁹ Estimated using 175 school days. School waste estimated by using a model suggested by ICLEI from the California Integrated Waste Management Board (<http://www.ciwmb.ca.gov/WasteChar/WasteGenRates/Institution.htm>):

School 0.6 lb/person/day May 1997 Guide to Solid Waste and Recycling Plans for Development Projects (Santa Barbara County Public Works Department)

D. Forecasted Growth and Reduction Measures

City of Kodiak Forecasted Growth

Description	Sq. Ft (2007)	Sq. Ft. 2020	Year	Multiplier	Base Electric	Electric	Base fuel	Fuel	CO ₂ 2007	CO ₂ 2020	
Library	10728	20,000	2013	1.86	81200	151032	4251	7907	65	106	
Police Station	7000	23000	2010	3.29	161712	532032	8317	27363	129	423	
Fire Station	6000	20000	2016	3.33	107808	359001	6388	21272	95	317	
Public Works Main Bldg	8,300	(Replace bldg in 2018, but no estimated increase in size)								129	n/a
New Additions											
New Additions	Sq .Ft.	Year	Est. CO ₂ /1000 sq.ft.	Est. % Increase over similar bldg	Est. Electric	Est. Fuel	CO ₂ 2007	CO ₂ 2020			
Boat lift Lights	0	2009			180,000	0	0	39			
Boat Lift Facility	800	2009	15.5 (PW Bldg)		n/a	n/a	0	12.4			
UV Treatment Plant	4352	2011		30% more than Sewage Plant	687523	25380	0	435			
TOTAL									289	1332.4	

Notes & Assumptions: Several municipal facilities are overdue for new buildings; the Library, Police and Fire Stations, and the Public Works Main Building are all assumed new buildings by the year 2020, with the actual year built and square footage estimated. Base Electric and Fuel columns represent the baseline data collected for these facilities in FY 2007, while the Electric and Fuel columns represent forecasted values based on the increase in square footage multiplied against baseline data. The results demonstrate an increase in CO₂ emissions under a “business as usual” scenario, i.e., with no attempts to improve facility efficiency from that of FY 2007.

For new additions without baseline data, two different columns were used as possible calculations for future CO₂ levels. Estimated CO₂/1000 sq. ft. represents values that can be taken from baseline efficiency reports by 1000 sq. ft. of current facilities. The efficiency level for the Boat Lift facility was estimated at higher than the average (9.5 tons/1000 sq. ft) because of the electric draw for an outdoor heating pad. The Public Works Main Building was selected as an estimate because of its higher use of electricity and fuel in daily operations (15.5 tons/1000 sq. ft.). In the case of the Boat Lift lights, although energy efficiency measures such as limited use may be implemented, basic electricity use was estimated by the Harbor Department. The UV Treatment Plant is estimated by the Public Works Department to use 30% more energy than the Spruce Cape Sewage Treatment Plant.

Kodiak Island Borough & KIBSD Forecasted Growth

Description	Sq. Ft (2007)	Sq. Ft. 2020	Year	Multiplier	Base Electric	Electric	Base fuel	Fuel	CO ₂ 2007	CO ₂ 2020
KHS/Borough Admin/Pool	296050	293000	?	0.99	2219296	2197103	161728	160110.7	2325	2302
Bayside Fire Addition	5400	13400	2009	2.48	55380	137342.4	4647	11524.56	64	159
North Star Addition	41400	49200	?	1.19	327240	389415.6	19809	23572.71	294	350
New Additions	Sq. Ft.	Year	Est. CO₂/1000 sq ft		Est. % Increase over similar bldg		Est. Electric	Est. Fuel	CO₂ 2020	
Fish and Game	23500	2010	9.5						223.25	
TOTAL									2683	3034.25

Notes and Assumptions: The largest facility improvement projected before the year 2020 is a complete remodel of the Kodiak High School Complex, combining the Borough Administration Building with the new complex. Because of this combination, the total square footage of the complex actually declined slightly. Using this multiplier against combined baseline data for the two facilities projects a slight decrease of CO₂ emissions. Additions in area to the Bayside Fire Station and North Star Elementary School demonstrate CO₂ increases. Base Electric and Fuel columns represent the baseline data collected for facilities in FY 2007, while the Electric and Fuel columns represent forecasted values based on the increase in square footage multiplied against baseline data. The results demonstrate an increase in CO₂ emissions under a “business as usual” scenario, i.e., with no attempts to improve facility efficiency from that of FY 2007.

For new additions without baseline data, two different columns were available as possible calculations for future CO₂ levels, following the model used for the City of Kodiak forecasts. Estimated CO₂/1000 sq. ft. represents values that can be taken from baseline efficiency reports by 1000 sq. ft. of current facilities. The only completely new building forecast is a Fish and Game office structure that would be owned and operated by the Borough. Since no estimates were available for energy usage, a very basic forecast was made using the average CO₂ emissions/1000 sq. ft. for FY 2007 baseline facilities.

E. Reduction Measures

City of Kodiak Implemented Reduction Measures since FY 2007

Measure Name	Year	Sq. Ft.	% Reduction	Base Energy	Reduced Energy	Base \$	Reduced \$	Tons CO2 Reduced
Kodiak Fire Department New Boiler / Reduced Usage (a)	2008	6,000	30%	6388 gals. fuel	4472 gals. fuel	14,436	8662	22
Kodiak Fire Department Lighting Upgrade: T8 Ballasts (b)	2007	6,000	30%	107808 kWh	64685 kWh	18952	11371	7
Public Works Boiler Efficiency Adjustment (a)	2008	8,300	30%	8629 gals. Fuel	5177 gals. fuel	19501	11701	29
Harbor Building installed temperature sensor for boiler (a)	2007	2,604	10%	2299 gals. Fuel	2069 gals fuel	5195	4676	3
Public Works Leak Correlator (Identifies water leaks, which would reduce usage) (a)	2008		11%	2437472 kWh	2166913 kWh	430944	383109	59
Parks and Recreation LED Christmas Lights (a)	2007		78%	24492 kWh	5374 kWh	Donated by KEA		4
Kodiak Police Department Vehicle Downsize: 4 SUVs to 4 sedans in 2007-8 (b)	Estimated increase in fuel efficiency is from 14.1 mpg for SUVs to 22.8 mpg for mid-size sedans. Using an average fuel usage of 801 gals/yr, CACP software calculated 9 tons of CO2 were reduced per vehicle. Percentage reduction is about 38%.							32
Total Reductions FY 2007 - Present						489,028	419,519	156

Source: CAPA Model Output

Notes and assumptions: Implemented measures that reduce energy use have been calculated using estimated reduction percentages in all cases except for the Leak Correlator, the Public Works boiler adjustment, and the LED Christmas Lights, where real tracking data was available from Department directors. All measures followed by an (a) represent estimated reductions provided by the Department; measures followed by a (b) represent estimated reductions obtained from the Beta version of a software program provided by ICLEI, the CAPPAs preview. Both measures listed for Public Works utilized empirical data gathered over the summer of 2008; because results were extrapolated from a small data set, continued tracking will allow further evaluation of these measures. Tons of CO₂ reduced were calculated by entering reduction data into the ICLEI software Measures Analysis.

City of Kodiak Potential Future Reduction Measures

Possible Future Measures	Sq. Ft.	% Reduction	Base fuel (gals.)	Reduced fuel (gals.)	Base Electric	Reduced Electric	Tons CO ₂ Reduced
Library LEED	20000	28%	7907	5693	151032	108743	34
Police Station LEED	23000	28%	27363	19701	532032	383063	118
Fire Station LEED	20000	28%	21272	15316	359001	258481	89
Public Works LEED	8300	28%	8629	6213	146928	105788	36
Monashka Pumphouse Upgrade		20%			2240352	1792282	97

Source: CACP Model Output

Notes and assumptions: Although the City of Kodiak has several policies in place to reduce and conserve energy, including downsizing the vehicle fleet to more fuel efficient vehicles where possible, it is difficult to quantify many of these measures without using specific baseline data. Potential measures that can be quantified against forecasted growth include the policy of new facilities built to high-efficiency standards. If the four new facilities forecasted by 2020 were to be built LEED certified, the forecasted energy consumption under a business as usual scenario would be reduced by an estimated 28% (CAPP software uses 28% as an average between all LEED standards). Also, the Department of Public Works has indicated that it would like to evaluate current electrical usage at the Monashka and Pillar Creek Pumphouses; the equipment at these stations is old and most likely inefficient, and the Monashka Pumphouse in particular uses a large quantity of electricity in its operations. CAPP software estimates that replacing pumps for municipal water systems can result in a 20% energy savings.

Kodiak Island Borough and KIBSD Implemented Reduction Measures since FY 2007

Measure Name	Year	Sq. Ft.	% Reduction	Base Energy	Reduced Energy	Base \$	Reduced \$	Tons CO ₂ Reduced
East Elementary HVAC upgrade	2007	39,800	15%	23442 gals. fuel	19926 gals. fuel	\$64,105.00	\$54,489.00	40
Middle School new insulated roof	2007	52,000	5%	33080 gals. fuel	31426 gals. fuel	\$74,759.00	\$71,021.00	19
Total Reductions FY 2007-Present						\$138,864.00	\$125,510.00	59

Source: CAPA Model Output

Notes and assumptions: Implemented measures that reduce energy use have been calculated using estimated reduction percentages. The HVAC upgrade for East Elementary estimated reductions were provided by the Borough; estimated reductions for the Middle School roof were derived from a Beta version of new ICLEI software, the CAPPA preview.

Kodiak Island Borough and KIBSD Potential Future Reduction Measures

Possible Future Measures	Sq. Ft.	% Reduction	Base fuel (gals.)	Reduced fuel (gals.)	Base Electric	Reduced Electric	Tons CO ₂ Reduced
Boiler Replacement: East Elementary School	39,800	15%	19,926	16,937			34
Boiler Upgrade: Bayside Fire Station	13,400	10%	11,525	10,372			13
Boiler Control Upgrade to Fisheries Research Center	33,200	10%	67,526	60,773			76
Digital Control for new KHS/ Borough Admin	293,000	10%	160,110	144,099			180
New KHS/Borough Building LEED standard		28%	160,110	115,279	219703 kWh	158186 kWh	517
Digital Control for new Fish and Game Building	23,500	10%					
Fish and Game Building LEED standard		28%					

Source: CACP Output Model

Notes and assumptions: Boiler replacements and upgrades have been estimated at 15% for a new system and 10% for upgrades/digital controls after discussions with the Borough Maintenance Director and a representative with Proctor Sales, Inc. in Anchorage. Old commercial boilers tend to run around 70-73% efficient, while new commercial boilers tend to run between 85-88% efficient. Equipment available to control boiler operations in response to outside air temperature and other factors are estimated at 10-15% increase in efficiency for both commercial and residential scale upgrades. The Borough is implementing a “Direct Digital Controls” Program for all new and remodeled buildings, with an estimated savings of 10-15%. For the purpose of this table, estimated forecast data has been used for facilities that are expected remodel/new buildings. This table represents potential scenarios, using baseline and forecast data. If the new buildings are constructed according to LEED standards, the average LEED energy savings is 28% over a non-LEED building.