**College of Saint Benedict**

**St. Joseph, MN**

**Greenhouse Gas Emissions Inventory**

**Report**

**Fiscal Years (FY) 13-14**

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Report Issue Date: December 2014**Executive Summary**

The Office of Sustainability at the College of Saint Benedict (CSB) has completed the greenhouse gas (GHG) emission inventory (carbon footprint). Intern Tyler Thompson, Project Coordinator Nick Bradley, and Sustainability Coordinator Alex Chocholousek were responsible for data collection and analysis. Director of Sustainability, Judy Purman, served in an advisory role to this process. This report includes the methodology used to determine the footprint as well as an analysis of footprint data for fiscal years FY13 and FY14 (hereafter, FY13 and FY14, respectively) and trends over time.

As shown in Table 1, CSB’s carbon footprint for FY 14 increased 841 mtons, or 4.6% over FY13 totals. Both FY13 and FY14 have shown emissions increases from FY12’s total emissions of 14,037 mtons CO2e (Table 1). From FY12 to FY13, CSB realized a decrease in emissions from faculty/staff commuting, study abroad air travel, fertilizer usage, and direct transport, and an increase in emissions from purchased electricity. From FY13 to FY14, emissions from faculty/staff commuting, study abroad air travel, and purchased electricity decreased while emissions from direct transport increased. Fertilizer use remained the same. These changes in data will be further explained in the appropriate sections in this report.

**Table 1. Comparison of total greenhouse gas emissions, FY09-FY14.**

\*Due to updates in the CACP calculator, emissions have changed slightly from those shown in previous versions of this report.The numbers provided here reflect this.

|  |  |  |  |
| --- | --- | --- | --- |
| **Fiscal Year** | **Net Emissions (tons)** | **Difference from Previous Year** | **Percent Change** |
| 2009\* | 14,336.7 | -708.7 | -4.7% |
| 2010\* | 13,440.0 | -896.7 | -6.3% |
| 2011\* | 16,185.3 | 2,745.3 | 20.4% |
| 2012\* | 15,475.1 | -706.8 | -4.4% |
| 2013 | 18,139.1 | 2,664.4 | 17.2% |
| 2014 | 18,680.0 | 540.9 | 3.0% |

**Greenhouse Gas Emissions Inventory Methodology**

**Protocol and Calculation Tools**

The GHG emissions inventory was conducted using the American College and University Presidents Climate Commitment’s (ACUPCC) Clean Air-Cool Planet (CA-CP) calculation tool, version 7.0, supplemented by the World Resources Institute’s (WRI) GHG Protocol. The GHG Protocol is the most widely accepted international standard for GHG accounting and is the basis of the CA-CP tool. The inventory of emissions included those arising from electricity consumption, heating and cooling, vehicle fleet operations, business and student travel (by air, rental vehicle and personal vehicle), waste management practices, wastewater treatment and daily commuting to and from the campus.

**Boundary, Data, and Timeframe**

All data used in the calculation of the carbon footprint were supplied by CSB staff (see Table 2).

CSB operates on a fiscal year that runs from July 1 through June 30. Data in this report is reported by fiscal year.

The boundary for the carbon footprint determination remains unchanged from previous calculations and includes the CSB campus demographics (detailed in Table 3), the buildings and grounds of the campus related operations and activities located in St. Joseph, MN; 290 acres, 1,292,986 square feet of building, power generation and consumption, business and study abroad travel, fertilizer use, faculty, staff and student commuting, refrigerants, waste water processing and solid waste management. The energy embedded in goods and products consumed in the regular course of doing business, and the capture and storage of carbon were not included in this analysis. Student commuting miles from home to campus during holidays and at the start and end of each semester are not considered in this report.

|  |  |  |
| --- | --- | --- |
| Data Type | Data Provider | Data Source |
| Budget | Anne Oberman, Controller | Business Office |
| Students | Jane Stromme, Classroom/Athletic Coordinator, Registrar’s Office | Registrar Official Tenth Day Reports |
| Faculty and Staff | Judy Bednar, Associate Director of Human Resources | CSB Ipeds HR |
| Building square footage | Brad Sinn, Executive Director of FacilitiesSharon Braegelmann, Division Coordinator | CSB Net and Gross Square Footage |
| Natural Gas and Steam | Terry Loso, Power Plant Director | Siemens, Billing Information |
| Direct Transportation (Diesel, Unleaded, Oil) | Brian Wentland, Accountant/Purchasing CoordinatorMike Juntunen, Transportation Director | Receipts |
| Refrigerants | Terry Loso, Power Plant Director | Gail Lancour, Central MN Refrigeration |
| Electricity Consumption | Terry Loso, Power Plant DirectorScott Hinde, XcelDave Gruenes, Stearns Electric | Fiscal Electrical Reports, Siemens Report, Billing Information |
| Faculty/Staff Commuting | Danielle Schmiesing, Human Resource Assistant | Faculty/Staff Excel Spreadsheet Calculations |
| Study Abroad Air Travel | Merry Hoppert, Office of Education Abroad | Study Abroad Excel Spreadsheet |
| Admission-related air travel | Kay Richter, Executive Assistant to the VP of Admission | Admissions Excel Spreadsheet |
| Fertilizer | Chris Brake, Grounds Supervisor | Receipts |
| Solid Waste | Larry Christen, Facilities Director | Lori Bruns, Office Manager, Advanced Disposal |
| Wastewater | Terry Loso, Power Plant Director | Metered |

**Table 2.** **Sources of data for the carbon footprint study.**

**Table 3. Campus demographics from FY12-FY14.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sector** | **Status** | **FY12** | **FY13** | **FY14** |
| **Students** | Full Time | 1895 | 2027 | 1999 |
|  | Part Time | 18 | 4 | 13 |
|  | **Full time equivalent\*** | **1904** | **2029** | **2005** |
| **Faculty** | Full time | 153 | 162 | 164 |
|  | Part Time | 28 | 39 | 27 |
|  | **Full time equivalent\*** | **167** | **181** | **177** |
| **Staff** | Full time | 295 | 315 | 315 |
|  | Part Time | 30 | 20 | 20 |
|  | **Full time equivalent\*** | **310** | **325** | **325** |

\*2 part time = 1 full time

**Carbon Footprint Gases and Unit of Measure**

The carbon footprint is measured in metric tons of carbon dioxide equivalent (mton CO2e). A metric ton is 2,205 pounds. The carbon dioxide equivalent is the common unit of multiple greenhouse gases emitted within the footprint boundary converted to standard terms by use of the Global Warming Potential (GWP).

The GWP is a measure of how much a gas contributes to global warming over a period of time (100 years) compared to carbon dioxide and allows comparison of the impact of the concentrations of GHGs to each other. Carbon dioxide has been assigned a GWP of 1 since it is the most prevalent GHG.

Although some GHGs may be present in the atmosphere in lesser quantities than carbon dioxide, they may have a longer lifespan in the atmosphere and may, in the long run, be much more detrimental. A higher GWP indicates that gas is a more potent GHG. Table 3 compares the GWP for the six major GHGs included in a carbon footprint.

**Table 4. Comparison of the global warming potential (GWP) of the six greenhouse gases.**

|  |  |  |
| --- | --- | --- |
| **GHG** | **Symbol** | **GWP\*** |
| **Carbon Dioxide** | CO2 | 1 |
| **Methane** | CH4 | 25 |
| **Nitrous Oxide** | N2O | 296 |
| **Hydrofluorocarbons** | HFCs | 120-12,000 |
| **Perfluorocarbons** | PFCs | 5,700-11,900 |
| **Sulphur Hexafluoride** | SF6 | 22,200 |

**Emissions Inventory Details**

Overall, emissions for the greenhouse gas inventory totaled 18,298.7 mtons CO2e for FY13 and 19,140.2 mtons CO2e for FY14. This is an increase from the 14,036.7 mtons CO2e recorded in fiscal year 2012, or a 5,103.5 mton CO2e increase from fiscal 2012 to fiscal FY14. Table 5 provides a summary of emissions from operations and Table 6 compares CO2e by different metrics; per student, per person and per square foot of building. Figures 1, 2 and 3 graphically depict emissions by year and category.

**Table 5. Greenhouse gas emissions (mtons CO2e) by category from FY11-FY14.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **FY11** | **% of Total** | **FY12** | **% of Total** | **FY13** | **% of Total** | **FY14** | **% of Total** |
| **Other On Campus Stationary** | 4,805 | 29.7 | 3,776 | 24.4 | 4,803 | 26.5 | 5,379 | 28.8 |
| **Direct Transportation** | 292 | 1.8 | 290 | 1.9 | 303 | 1.7 | 311 | 1.7 |
| **Refrigerants** | 100 | 0.6 | 100 | 0.6 | 94 | 0.5 | 94 | 0.5 |
| **Agriculture (Fertilizer)** | 8 | 0.05 | 7 | 0.05 | 8 | 0.04 | 7 | 0.04 |
| **Purchased Electricity** | 6,742 | 41.3 | 6,631 | 42.8 | 8,738 | 48.2 | 8,879 | 47.5 |
| **Faculty/Staff Commuting** | 1,235 | 7.6 | 1,226 | 7.9 | 1,077 | 5.9 | 1,077 | 5.8 |
| **Student Commuting****(ABE driving miles)** | 44 | 0.3 | 47 | 0.3 | 34 | 0.2 | 47 | 0.3 |
| **Direct Financed Air Travel****(Admissions, ABE air miles, previous average)** | 337 | 2.1 | 395 | 2.6 | 300 | 1.7 | 270 | 1.4 |
| **Other Direct Financed Travel** | 21 | 0.1 | 26 | 0.2 | 12 | 0.1 | 11 | 0.1 |
| **Study Abroad Air Travel** | 2,166 | 13.4 | 2,548 | 16.5 | 2,212 | 12.2 | 2,038 | 10.9 |
| **Solid Waste\*** | (2) | -0.01 | (2) | -0.01 | (2) | -0.01 | (2) | -0.01 |
| **Wastewater** | 21 | 0.1 | 21 | 0.1 | 21 | 0.1 | 23 | 0.1 |
| **T&D Losses\*\*** | 417 | 2.6 | 410 | 2.6 | 540 | 3.0 | 549 | 2.9 |
| **TOTAL** | **16,185** |  | **15,475** |  | **18,139** |  | **18,680** |  |

\*Most waste is combusted to generate electricity which results in a credit to total emissions. Please refer to details below under the Solid Waste heading.

\*\*Transmission and Distribution line losses associated with purchased electricity

Table 6 shows an enrollment increase of 101 students in FY14 over FY12 numbers. FY 13 and FY14 data shows significant increases in campus square footage over FY 12 data.

**Table 6. Comparison of metric tons CO2e by demographics and square feet from FY12-FY14.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Category** | **Number of units** | **Metric tons CO2e by Category** |
| **FY12** | Number of Students | 1,904 | 8.13 mtons/student |
|  | Number of Students, Faculty, Staff | 2,381 | 6.50 mtons/person |
|  | Square Feet of Buildings | 1,231,461 | 0.013 mtons/ft2 |
| **FY13** | Number of Students | 2,029 | 8.94 mtons/student |
|  | Number of Students, Faculty, Staff | 2,565 | 7.07 mtons/person |
|  | Square Feet of Buildings | 1,292,986 | 0.014 mtons/ft2 |
| **FY14** | Number of Students | 2,005 | 9.32 mtons/student |
|  | Number of Students, Faculty, Staff | 2,542 | 7.35 mtons/person |
|  | Square Feet of Buildings | 1,292,986 | 0.014 mtons/ft2 |

**Power Production and Consumption**

## Natural Gas and Electricity

Emissions from purchased electricity from Xcel Energy were calculated using emission factors representing the power pool average for kilowatt hours consumed in the MROW sub-region. The use of power pool average emission factors is a standard method incorporated into CA-CP and is used by the WRI in their GHG Protocol, and the U.S. Department of Energy in the recently revised 1605(b) Voluntary Reporting of Greenhouse Gas Emissions Program.

Data for natural gas consumed and electricity purchased is detailed in Table 7 above. Natural gas is reported in pounds of steam. The conversion, according to the EPA, from pounds of steam to ktbu is x 1.094. To convert from ktbu to mmbtu, the number is divided by 1000. Data shows a large increase in the amount of natural gas used from FY12 to FY14. This can be attributed to a combination of factors, discussed below.

First, FY13 and FY14 experienced colder winters relative to FY12. FY13 had a total of 7706 heating degree days (HDD) and FY14 had a total of 8597 HDD. Comparatively, FY12 saw only 5853 HDD. An increase in HDD leads to increased heating loads for the college, and thus is one factor in the significant increase in natural gas and purchased electricity.

Second, increases in emissions can also be attributed to the central power plant’s need to burn heating oil in FY14 due to the extreme cold. Because we are on an “interruptible rate” from Xcel, in periods of extreme cold, Xcel may ask CSB to switch their plant to an alternative source of fuel. During one particularly cold stretch, Xcel saw increased heating demand and, therefore, asked CSB to switch to their alternative fuel source, heating oil, a very carbon-intensive source of heating.

Finally, several buildings, gas lines, and separate accounts not accounted for in previous reports were included in this update. These included the Maintenance and Transportation Shops, College Avenue Apartments, Renner House, Jeanette House, and Rainbow House. Additionally, our new LEED Platinum certified Centennial Commons housing complex came online in FY13 and added about 50,000 square feet of building to our total. The inclusion of these buildings significantly increased the amount of purchased electricity and gas for heating and cooling.

The combination of more extensive metering, addition of campus buildings, and two exceptionally harsh winters have contributed to overall emissions increases. It should be noted, however, that despite an increase in campus building size and the aforementioned factors, our emissions per square foot remained virtually the same. We maintain an efficient campus, and it is reflected in this metric.

**Table 7. Natural gas (MMBtu) and electricity purchased from FY12-FY14.**

|  |  |  |  |
| --- | --- | --- | --- |
|  Energy Source | 2012 | FY13 | FY14 |
|  |  |  |  |
| Natural Gas (MMbtu) | 70,959 | 90,244 | 84,919 |
| Purchased Electricity (kWh) | 9,447,445 | 12,499,132 | 12,649,869 |

## Direct Transportation Sources

**Table 8. Mileage and gallons for transportation and groups from FY12-FY14.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Activity |  FY12 |  |  FY13 |  |  FY14 |  |
| Air Miles(Passenger miles) | Miles | Gasoline (gallons) | Diesel(gallons) | Miles | Gasoline(gallons) | Diesel(gallons) | Miles | Gasoline(gallons) | Diesel(gallons) | Propane(gallons) |
| Study Abroad Travel | 5,013,310 | - | - | 4,352,268 | - | - | 4,008,782 | - | - | - |
| ABE trips  | 208,685 | - | - | 265,013 | - | - | 210,717 | - | - | - |
| Faculty/Staff  | 568,056 | - | - | 324,783 | - | - | 319,949 | - | - | - |
| Activity |  FY12 |  |  FY13 |  |  FY14 |  |
| Vehicle Commuting | Miles | Gasoline (gallons) | Diesel(gallons) | Miles | Gasoline(gallons) | Diesel(gallons) | Miles | Gasoline(gallons) | Diesel(gallons) | Propane(gallons) |
| Faculty and Staff | 3,257,844 | - | - | 2,860,957 | - | - | 2,860,957 | - | - | - |
| Student Commuting | 125,956 | - | - | 89,724 | - | - | 125,478 | - | - | - |
| The Link | 82,092 | - | 14,701 | 86,163 | - | 15,430 | 84,264 | - | 15,090 | 5,283 |
| Trobec’s | 13,846 | - | 2,518 | 13,100 | - | 2 ,382 | - | - | - | - |
| Admissions Miles | 68,242 | - | - | 32,317 | - | - | 27,817 | - | - | - |
| Gasoline Fleet | - | 12,229 | - | - | 13,015 | - | - | 13,682 | - | - |

Table 8 details the number of air and vehicle transportation miles and gallons of either diesel or gasoline by program or group, as well as diesel fuel and propane fuel consumed by the inter-campus busing system (The Link) between the College of Saint Benedict and Saint John’s University. Emissions for the Link are calculated from fuel usage data provided by CSB/SJU Transportation. The total number of gallons of fuel used by The Link was divided by two, accrediting half of the emissions to Saint John’s University as approximately half riders are enrolled at Saint John’s and half at Saint Ben’s. During FY14, the transportation department began using a Link bus powered by propane. Additionally, prior to FY13, Trobec’s Bus Company was contracted to support the transportation of students between campuses, thus you’ll find that data above. This service was discontinued in FY13, due to the purchase of new buses by the colleges.

The gallons of gasoline used directly on Saint Ben’s campus, such as fuel for security vehicles and grounds equipment, and for the President’s and President’s Assistant cars are also included in the table above. Gasoline data for fleet vehicles was provided by transportation as well.

## Air Travel and Business Travel

Air miles and emissions for study abroad travel were calculated using data from the Office of Education Abroad. Semester long programs, external programs, as well as May term trips were included. In order to calculate mileage per trip, www.worldatlas.com was used to calculate the distances to each location. Study abroad air miles account for all Saint Ben’s students that study abroad and half of the faculty.

Alternative Break Experience (or ABE, a one to four week service trip) air miles were calculated using data from the Campus Ministry Office. Again, mileages for only Saint Ben’s students were counted as well as half of the faculty for each trip. The website www.worldatlas.com was also used to calculate round trip distances for each location.

Faculty/Staff air miles calculations for FY13 and FY14 were calculated using slightly different methodology than in previous reports. First, part of the air mileage data was provided by the Admissions office. Admissions air miles are the miles recorded by the Admissions office to fly in prospective students and fly employees to recruit students for the college. This data source was used in previous reports. The remaining faculty and staff air mileage data came from the business office. The need to change methodologies arose because the college discontinued the use of a travel agent to book faculty and staff flights and thus, we were left without an air miles tracking system in FY11-FY12. Rather than assume the mileage was the same as in previous years, and since these emissions are Scope 3 and therefore optional for inclusion, it was decided to exclude this category from the updated total emissions. For FY13 and FY14, however, because faculty and staff started booking their own flights and applying for reimbursement, the business office began tracking reimbursed air miles for these fiscal years. Thus, the data for FY13 and FY14 faculty and staff air miles came from a combination of Admissions data and Business Office data.

Additionally, faculty/staff drive to nearby regions in order to recruit students. The amount of driving miles by faculty/staff for recruitment was also recorded by the Admissions Office. This number was divided by two to only include CSB faculty/staff and was used in our calculations.

## Faculty/staff and student Commuting

Faculty/staff commuting miles were calculated by taking the home zip-code for each employee and determining a one-way, straight-line distance from the center of that zip-code to CSB. We then multiplied this distance by two to get a round-trip distance, which was then multiplied by an assumed five trips per week for full-time employees and three trips per week for part-time. Since there are faculty and staff that work at both Saint Bens and Saint Johns all faculty/staff driving miles were added together and divided by two with each institution reporting half.

Due to the lack of a system for tracking student commuting miles to-and-from campus, and given that this mileage’s inclusion in the calculator is optional, this report’s student commuting emissions are reported using only ABE driving mileage data. In the FY09-FY10 report, student commuting included Link bus mileage as well as an average of student commuting data (which came from surveys) found the FY07 and FY08 report. We excluded this prior data because habits change over time, the Link has its own emissions reporting in the calculator, and we didn’t want to blindly guess at current student commuting data. Thus, the large decrease in reported student commuting emissions between FY12 and FY13 can be explained by this.

## Wastewater

**Table 9. Gallons of wastewater disposed from 2010-2012.**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2012 (Gallons) | FY13 (Gallons) | FY14 (Gallons) |
| Total | 39,692,000 | 40,237,000 | 43,612,000 |

\*Estimated. No metering in place at during this time.

Wastewater generated on campus is processed by St. Cloud Wastewater Treatment plant by anaerobic digesters. Table 9 outlines the gallons of wastewater disposed as reported by the metering system put into place at the end of fiscal year 2011.

**Refrigerant Use**

 **Table 10. Refrigerant usage on campus (pounds) from FY10-FY12.**

|  |  |  |  |
| --- | --- | --- | --- |
| Refrigerant | FY12 | FY13 | FY14 |
| R-22 | 85.19 | 110.9 | 110.9 |
| R-404A | 56.44 | 1.32 | 1.32 |
| R-507 | 2.375 | 0 | 0 |
| R-134A | 0.5 | 1.08 | 1.08 |
| Other | 88 | 37 | 37 |

CSB contracts with Central MN Refrigeration to maintain CSB’s refrigerants and thus, Central MN Refrigeration provided the resupply data for CSB each year. Refrigerants resupplied at CSB for FY13 and 14 include R-22, R-404A, HP-62, and R-134A; the most abundantly resupplied is R-22, followed by HP-62, although the CA-CP calculator classifies HP-62 in the “other” category. Central MN Refrigeration was unable to provide data for the exact time period of FY13 and FY14, so to calculate refrigerant usage for these time periods, we calculated an average per-month usage of each refrigerant and multiplied that number by 12, to estimate usage in each fiscal year. Refrigerants contributed about 0.5% of total emissions in FY13 and FY14

**Fertilizer Use**

The GHG nitrous oxide (N2O) is formed from fertilizer application through oxidation processes that convert a small portion of the N to small amounts of N2O. CSB Grounds applies both synthetic and organic fertilizer on campus to maintain an aesthetic landscape. Organic fertilizer usage increased 41% from FY13 to FY14. Fertilizer contributed to 0.04% of total emissions in FY13 and 0.04% in FY14.

**Table 11. Fertilizer application (pounds) by type from FY12-FY14.**

|  |  |  |  |
| --- | --- | --- | --- |
| Type of Fertilizer | 2012 | FY13 | FY14 |
| Synthetic | 7,970 | 9,816 | 8,941 |
| Organic | 850 | 650 | 1,100 |

**Solid Waste Management**

**Table 12. Solid waste generated (short tons) and methods processed from FY12-FY14.**

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Refuse Derived Fuel | CH4 Recovery and Electric Generation | Totals |
| FY12 | 192 | 64 | 256 |
| FY13 | 201 | 67 | 268 |
| FY14 | 245 | 64 | 309 |

Monthly totals of refuse derived fuel and landfill with CH4 recovery & flaring were acquired from Advanced Disposal, St. Cloud, MN. Solid waste refers to garbage accumulated on campus. Advanced Disposal transports the school’s waste to an incinerator. At times the incinerator is down for repairs. When the incinerator is down, the solid waste is transported to the Minden Transfer Station. The Minden Transfer Station then hauls the waste to a landfill with CH4 recovery and electric generation. Solid waste management at CSB actually decreases the total emissions of CSB because most waste is combusted to generate electricity, a form of renewable energy generation, which results in a credit to total emissions. In FY13 solid waste decreased total emissions by 0.01% and 0.01% in FY14.

**Summary/Challenges**

This report, we believe, represents the most accurate version of our Greenhouse Gas Inventory yet. We have refined methodologies, expanded data collection, and solidified a process, which has allowed us to capture a more accurate picture of our campus. Overall, even though this improved process has led to an increase in our total emissions, we now have a more reliable system. Further, although net emissions increased, it is worth noting that, despite an increase in square footage and better metering, our emissions per square foot has remained the virtually the same. This shows that CSB is capable of adding volume, while maintaining high standards for energy efficiency and emissions.

Although methods of measurement have improved in most areas between the previous and present reports, there still remain a number of areas where data tracking can be improved, specifically student commuting and faculty/staff travel reimbursement.

Student commuting presents one of the most difficult challenges for data collection. One possible solution is to survey only students on campus who have purchased parking permits (available through security) and base estimations off of the received responses. This will provide updated driving information and offer a more accurate representation of student driving on a weekly basis. As stated before, this current report only expresses student commuting as a result of ABE trips.