Narrative for FY2015 GHG Emissions Inventory

June 24, 2016

A. Durnbaugh – Director of Sustainability – Loyola University Chicago

Introduction

Loyola University Chicago set out to track its Greenhouse Gas Inventory to serve as a quantitative understanding of our energy and environmental footprint. For FY2015, three students under my direction compiled the data for the inventory and worked with the calculator tool to generate the emissions report. Final analysis was completed by A. Durnbaugh in version 8.0 of the Clean Air Cool Planet's Excel Calculator administered by the University of New Hampshire. Following is a narrative of how the information was collected and any boundary constraints that were addressed throughout the process.

Boundary Setting

For FY15, the inventory's boundary included the Lake Shore, Water Tower, Retreat and Ecology Campuses and Cuneo Mansion. The Water Tower, Lake Shore Campuses, LUREC and Cuneo are considered individually as well as collectively. This boundary was expanded in FY14 so year over year comparisons should keep this in mind. NOTE: *In the future, Loyola will need to include the Health Sciences Campus.*

Temporal boundary was set at Financial Year 2015 (July 1, 2014 – June 30, 2015). Unless noted, all information is for within this time window. Information for other years was collected where possible to serve as comparative and baseline setting. Loyola uses FY2008 as the baseline year.

Operating Budget is from annual approved budget as reported in the University's Annual Report prepared by the Finance Office. Retrieved online.

Research Budget is from Office of Research Services (W Sellers). Only External dollars that are identified as 'Research' were accounted. We did not report this data for FY15 because we do not use it to normalize our data. Aaron D.

Energy Budget is the sum of the purchased electricity and natural gas for the given year. This is provided by H Gonzalez.

Total Building Space – This is from Facilities Building List worksheet provided by H Gonzalez. This includes any square footage that was actively occupied at any time during FY15.

Total Research Building Space – This is from Federal Government Indirect Rate agreement reporting. We did not report this data for FY15 because we do not use it to normalize our data.

Residence Life Space - This is from Facilities Building List worksheet. (H Gonzalez)

Scope 1

Scope 1 emissions are direct emissions from sources that are owned and/or controlled by the institution. This includes the combustion of fuels in college-owned facilities or vehicles, fugitive emissions from refrigeration, and emissions from on-campus agriculture or livestock.

Loyola has no co-generation facilities on the Lakeside Campuses and limited stationary and direct transportation (fleet) sources.

On-Campus Stationary (Natural Gas)

This is produced from monthly utility bills. Many utility bills fall slightly over or under the timeframe of this inventory but we utilized the determination of the Facilities Office to identify if they were within FY15. If necessary, each utility bill is assigned a Financial Year Quarter and could be analyzed even further. Total therms were reported and total cost was added to Electricity Bills to determine Energy Budget. (H Gonzalez)

Direct Transportation (Fuel purchases)

This is produced by running a budget report for this time for Budget Line 6421, Vehicle Costs – Fuel, and Budget Line 6420 – Vehicle Maintenance and Supplies, provided by IES Budget Manager E Racz. By inventorying the fleet we determined that 95% of fuel purchases were for gasoline and 5% were for diesel (primarily snow equipment). This inventory is conducted by Z Waickman. By using Chicago-area average cost of all grades (http://www.eia.gov/petroleum/gasdiesel/), all formulations of gasoline ($3.078 / gallon) and Midwest average cost of #2 Diesel Retail ($3.24 / gallon) we determined the number of miles to enter into the tracking spreadsheet. (E Racz) -- **R Keaveny**

Electric Fleet is not appropriate because all kWh are tracked under purchased electricity. Note: *These are not submetered.*

Refrigerants

For this inventory, no refrigerant data was collected although we anticipate including refrigerant data in future inventories. It is expected that this will be *de minimus*. (B Sherry and T Rustwick)

Chemicals

We were able to receive tracking sheets for chemicals being disposed of. No chemicals were determined to include trackable greenhouse gases. This section is considered to be *de minimus.* (W Curtin)

Agriculture

We were able to receive tracking sheets for fertilizer use on Lake Shore Campus (none is used at Water Tower, Cuneo or LUREC) for both Facilities and our landscape contractor (Clauss

Brothers) (W Curtin). Simple calculations determined weights for nitrogen in fertilizer and entered into tracking spreadsheet. **C Kochis received trackable information from W Curtin.**

Scope 2

Scope 2 emissions are indirect emissions from sources that are neither owned nor operated by your institution but whose products are directly linked to on-campus energy consumption. This includes purchased electricity, steam and chilled water. Loyola has no purchased steam or purchased chilled water sources.

Purchased Electricity

This is produced from monthly utility bills. Many utility bills fall slightly over or under the timeframe of this inventory but we utilized the determination of the Facilities Office to identify if they were within FY15. If necessary, each utility bill is assigned a Financial Year Quarter and could be analyzed even further. Total kilowatt hours were reported and total cost was added to Gas Bills to determine Energy Budget. (H Gonzalez)

Please note, these fuel sources are determined by eGRID from the most recent data file for power generation in our region (RFCW) https://www.epa.gov/energy/egrid. As generation plants change, this emission footprint may be updated as the grid generation source is updated. This information is from eGRID2012 data file.

Scope 3

Scope 3 Emissions – Other indirect emissions attributed to an institution. This includes emissions from sources that are neither owned nor operated by an institution but are directly financed or otherwise encouraged or influenced by the institution. These include air travel, commuting, solid waste disposal and transportation/distribution losses from energy.

Commuting Data – Faculty and Staff

By using the results of the Metropolitan Planning Council's 2014 Commuter Options Post Survey and information from Human Resources, we estimated the median distance for faculty/staff from their primary campus using the center point of their residential zip code. The number of trips per week per mode was then multiplied by the number of faculty/staff, the median mileage and 50 weeks per year, accounting for vacations. This is a conservative estimate because not all employees are full-time. NOTE: *Additional data is available for other modes not listed (bike, walking, rideshare) and thus additional detail on avoided emissions could be developed.* For the sake of this effort staff and faculty were analyzed together. (Office of Sustainability / Metropolitan Planning Council Commuter Options Survey)

Commuting Data – Students

Using the 2015 Student Commuting Options Survey conducted by the Office of Sustainability and Student Development we estimated the number of students taking trips by various modes, by their reported distance to their primary campus. Each subset was assigned a median distance and the modes were multiplied by the number of students and the average mile.

Air Travel

Faculty and Staff- Email request to Provost's Office (J. Pappas). Received Procard and total budget line 6302, 6303 and 6310 amount for air fares. A budget analyst was able to use payment data to identify airline related expenses. These amounts were tallied. Amounts in categories related to travel agents or general transportation were tallied. Amounts related to reimbursements were tallied. A coefficient was applied to these amounts to consider a percentage attributed to airfare. This was considered the airfare amount spent minus 20% to remove taxes and airport fees. To determine flown miles, this amount was divided by $.1587 cents per mile.

(www.airlines.org/pages/annual-round-trip-fares-and-fees-international--.aspx)

Total Amount	**Coefficient**	**Percentage Amount**
$ 1,234,664.29	1	$ 1,234,664.29
$ 133,980.95	0.5	$ 66,990.48
$ 5,313,244.53	0.33	$ 1,753,370.69
$ -		
$ 9,536,841.52		**$ 3,055,025.46**

Est. Air Fare Paid	Minus Fees and Taxes	Avg. Cost per Air Mile	Est. Air Miles Flown
$ 3,055,025	$ 2,444,020	$ 0.1587	**15,400,254**

Students- Started by an email request to International Affairs (J Engel). We received summary of all student study abroad participants from T Zanoni. We used number of students TIMES mileage between Chicago O'Hare and main international city TIMES 2. We did not account for other return trips or trips in country, but only included the return trip from Chicago to host city. We used the World Atlas site to determine distance between cities. http://www.worldatlas.com/travelaids/flight_distance.htm)

Program Country	Program Participants	Miles (one way)	Miles (roundtrip)	Total Miles
MAR	5	4289	8578	42890
ARG	4	5614	11228	44912
AUS	6	9245	18490	110940
AUT	2	4707	9414	18828
BLZ	27	1691	3382	91314
CHE	1	4388	8776	8776
CHL	9	5326	10652	95868
CHN	45	6571	13142	591390
CRI	7	2224	4448	31136
CUB	3	1351	2702	8106
CZE	7	4544	9088	63616
DEU	7	4420	8840	61880
DOM	1	1951	3902	3902
ENG	42	3965	7930	333060
ESP	86	4412	8824	758864
FRA	18	4146	8292	149256
GHA	1	5850	11700	11700
GRC	16	5456	10912	174592
HRV	1	5018	10036	10036
IND	2	8525	17050	34100
IRL	16	3624	7248	115968
ITA	391	4830	9660	3777060
JPN	5	6267	12534	62670
KOR	4	6530	13060	52240
NAP	1	4790	9580	9580
NLD	1	4113	8226	8226
NOR	4	4046	8092	32368
NPL	1	7612	15224	15224
NZL	2	8201	16402	32804
SCT	1	3669	7338	7338
TUN	17	4947	9894	168198
TUR	1	5483	10966	10966
VNM	31	8683	17366	538346
ZAF	4	8528	17056	68224
				Student Total
				7,544,378.00

A Durnbaugh and A Tisher determined and calculated information

Transmission and Distribution Losses – Directly related to our purchased electricity include the emissions related to the lost electricity during transmission and distribution through power lines and switch gear. This is out of the control of the end user and is thus incorporated in Scope 3. It is automatically calculated by the Calculator as a percentage of the electricity used in the reporting year.

Solid Waste – Landfilled Waste – Using the waste/recycling tracking, we were able to account for the last 6 years of landfilling at Orchard Hills, transported by Lakeshore Recycling. In the

Chicagoland region, landfills are all constructed with methane recovery, however electric generation will be up and running in the next few months (W Curtin). (http://www.advanceddisposal.com/il/davis-junction/orchard-hills-landfill) **C Kochis worked with B Curtin to get this information.**

Other Scope 3 Notes:

Although not included in the FY2015 Inventory, other scope 3 emissions are well under 5% and can be categorized as 'De Minimus' including water treatment (both potable water from Chicago Water Management and sewage treatment from Metropolitan Water Reclamation District), paper use and solid waste and recycling transportation.

Offsets:

Onsite Composting – Received estimate weights for LUREC composting operations from E Zack. This is done by tracking the volume of the bins and number of batches of compost that are processed each year.

Forest Sequestration – Received tree inventory for LUREC from D Treering. Received tree inventory for Cuneo from T McGuiriman. Received tree inventory for Lake Shore Campus from D Treering and R Keller. Utilized two tools to estimate carbon sequestration rates by campus. One tool is an online calculator provided by North Carolina State University at http://www.carboncalculator.ncsu.edu/ . The other method used was the average sequestration rate of a tree in Chicago from the 2008 UFORE study: http://www.nrs.fs.fed.us/urban/monitoring/eco-analysis-chicago/

These two tools produced a range and the more conservative amount of carbon sequestered annually was reported.

RECs - In this reporting year, a student project purchased a significant amount of renewable energy credits (RECs) for all of the residence halls. Additional RECs were procured for specific buildings (Cuneo Hall)

RESULTS Summary:

FY2015	LSC	WTC	LUREC	Cuneo	Total Emission
	eCO2	*eCO2*	*eCO2*	*eCO2*	*eCO2*
Natural Gas	9,604.6	1,797.3	179.6	129.5	11,711.0
Vehicle Fuel	651.5		8.1		659.6
Fertilizers	0.4				0.4
Purchased Electricity	30,571.0	9,088.1	560.7	158.7	40,378.5
Faculty / Staff Commuting	1,380.8	920.5	57.3		2,358.6
Student Commuting	2,400.1	2,029.9			4,430.0
Faculty / Staff Air Travel	4,450.6	2,967.1			7,417.7
Other Directly Financed Travel					-
Study Abroad Air Travel	2,183.7	1,453.4			3,637.1
Solid Waste	119.0	73.5	14.3		206.8
Electricity Transmission Losses	1,889.5	561.7	34.7	9.8	2,495.8
Potable Water					-
Sewer Treatment					-
Offsets - Additional	(6.5)		(25.9)	(22.0)	(54.4)
Offsets - Non-Additional	(10,724.0)	(451.2)			(11,175.2)
Scope 1	10,256.5	1,797.3	187.7	129.5	12,371.0
Scope 2	30,571.0	9,088.1	560.7	158.7	40,378.5
Scope 3	12,423.8	8,006.1	106.2	9.8	20,546.0
All Scopes	53,288.7	18,891.5	854.7	298.0	**73,332.8**
All Offsets	(10,730.5)	(451.2)	(25.9)	(22.0)	(11,229.5)
Net Emissions:	42,558.2	18,440.3	828.8	276.0	**62,103.3**

Normalizing Factors (Area / Students)	LSC	WTC	LUREC	Cuneo	TOTAL
Square Feet	3,283,338	885,632	100,000	37,000	4,305,970
Scope 1	3.12	2.03	1.88	3.50	2.87
Scope 2	9.31	10.26	5.61	4.29	9.38
Scope 3	3.78	9.04	1.06	0.27	4.77
All Scopes	16.23	21.33	8.55	8.05	17.03
All Offsets	(3.27)	(0.51)	(0.26)	(0.59)	(2.61)
NET per SF	**12.96**	**20.82**	**8.29**	**7.46**	**14.42**
FTE Students	8,768	5,845	-	-	14,286
Scope 1	1.17	0.31	N/A	N/A	0.87
Scope 2	3.49	1.55	N/A	N/A	2.83
Scope 3	1.42	1.37	N/A	N/A	1.44
All Scopes	6.08	3.23	N/A	N/A	5.13
All Offsets	-1.22	-0.08	N/A	N/A	-0.79
NET per FTE	**4.85**	**3.15**	**N/A**	**N/A**	**4.35**

Glossary – (All definitions adapted from Clean Air / Cool Planet or drafted by LUC)

Cuneo Mansion – This is a facility in Vernon Hills, Lake County, Illinois. It is a single building on ~100 acres of formal garden.

De Minimus Emissions – Sources that add up to less than 5% are considered to be "de minimus" and need not be inventoried if the resources required to inventory them are restrictive. Where possible, these items are included on the 'high-end' of their range so that a conservative approach is considered.

Directly-financed Emissions – Any activities creating emissions, either on-site or at other locations, which are paid for by the institution are considered directly-financed. Many directly-financed emissions have limitations on the ability to modify or limit emissions but should be accounted for as they are 'owned' by the institution.

Greenhouse Gas Emissions – Any chemical compound emitted from an institutional process that absorbs and emits radiation within the thermal infrared range. The primary greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Human produced (Anthropogenic) greenhouse gas emissions (i.e., emissions produced by human activities) come from combustion of carbon based fuels, principally wood, coal, oil, and natural gas.

Lake Shore Campus – Includes all holdings near Broadway and Devon, Rogers Park / Edgewater campus. In 2016, this included 57 buildings.

Lakeside Campus – Includes Water Tower and Lake Shore Campuses

Offsets – This is a reduction in emissions of carbon dioxide or greenhouse gases made in order to compensate for or to offset an emission made elsewhere. For the sake of this inventory offsets include on-site composting, forest sequestration and purchased Renewable Energy Credits.

Organizational Boundary – This determines which part of the organization's emissions will be included in the inventory. It defines what buildings, actions and budgets will be included.

Operational Boundary – This further refines the organization boundary to determine which operations of an institution will be included in the inventory. Important aspects including budgeted versus actual and directly financed vs. encouraged vs. incentivized should be considered and noted here.

Renewable Energy Credits (RECs) -When a wind farm, geothermal field or other form of renewable resource is used to produce electrical power that power can be sold to a commercial power grid. If that is done, a renewable energy certificate is issued and that certificate can then sold to offset power use of a company located in a city far away from the power plant. Once the certificate has been sold, it is used to offset the buyer's electrical use and meet state

requirements. At that point, the certificate is retired as it can only be used one time for one power offset. (From TriplePundit)

Retreat and Ecology Campus – This is a facility in Bull Valley, McHenry County, Illinois. It is a single large building (~100,000 sf) used for retreat and education activities on ~100 acres of property. It has modest outbuildings (garage, sheds, farm-related).

Scope 1 Emissions – Direct emissions from sources that are owned and/or controlled by the institution. This includes the combustion of fuels in college-owned facilities or vehicles, fugitive emissions from refrigeration, and emissions from on-campus agriculture or livestock.

Scope 2 Emissions – Indirect emissions from sources that are neither owned nor operated by an institution but whose products are directly linked to on-campus energy consumption. This includes purchased electricity, steam and chilled water.

Scope 3 Emissions – Other emissions attributed to an institution often deemed "optional" emissions by corporate inventories. This includes emissions from sources that are neither owned nor operated by an institution but are directly financed or otherwise encouraged or influenced by the institution. These include air travel, commuting, solid waste disposal and transportation/distribution losses from energy.

Temporal Boundary – This determines the time frame for which data will be included in the inventory. Important aspects including annual year vs. fiscal year should be considered and noted here.

Water Tower Campus – Includes all holdings near Michigan Avenue, downtown Chicago. In 2016, this included 6 buildings of just over 885,000 square feet.