

DATA COLLECTION PROCESS – REGIONAL INDICATORS INITIATIVE

This report has been generated to document the process of data collection used for the Regional Indicators Initiative (Initiative) by describing where and how data was collected. The purpose of this report is to outline a replicable process to serve as a guide for both the Regional Indicators Initiative team as they continue to collect data as well as any other researcher who wishes to follow the RII process in other cities throughout Minnesota or across the country.

Since the Initiative cities are located throughout Minnesota, the goal was to collect city data from statewide sources that have been commonly accepted as a standard for each indicator. When state-wide data was not available, regional-specific data (such as that from the Metropolitan Council) was used in addition to other country-wide data (Census Bureau). For example, population and household data obtained from the Metropolitan Council was considered to be more accurate than data collected on a country-wide scale. In this case, separate data sources were used for Rochester and Duluth, since these two cities are outside of the Metropolitan Council region.

DEMOGRAPHIC DATA

Residents and Households

For the eighteen cities within the Twin Cities region, population and households data was obtained from the Metropolitan Council of the Twin Cities. The data was accessed through the Metropolitan Council website: (http://stats.metc.state.mn.us/data_download/DD_start.aspx). According to Metropolitan Council website citations, 2008, 2009 and 2011 data is from 'Metropolitan Council Research estimates', while data for 2010 is from the Census Bureau – Decennial Census SF1. For the two outlying cities (Rochester and Duluth), Population and Households data was obtained from the Census Bureau-Decennial Census SF1 exclusively. 2012 population and household estimates are forecasts based on actual historical data.

Jobs

Employment or 'Jobs' data was obtained from the North American Industry Classification System (NAICS) which is collected by the Minnesota Department of Employment and Economic Development as outlined by the NAFTA accords between Canada, the US and Mexico in the mid-1990s. The data was accessed through the Minnesota Department of Employment and Economic Development (DEED) website which houses the Quarterly Census of Employment Wages: (<http://www.positivelyminnesota.com/apps/lmi/qcew/ResultsDisp.aspx>). The process for collecting data was to select an individual city, select the time period 2008-2012 and then select 'Total of All Ownerships' and 'Total, All Industries'. The resulting data chart reports employment for each quarter of the year in addition to 'Annual' employment. The 'Quarter 2' data was used in this Initiative rather than 'Annual' data because it tends to be the least affected by seasonal fluctuation. The annual data was not chosen because it is an average of the four quarters and thus does not provide for optimal comparison purposes.

Population Density

Population Density is calculated using the land area in square miles divided by the population from each year. Land area data is obtained from the Census Bureau-2010, and is assumed to remain constant through the four-year study-period. Data was accessed through the United States Census Bureau website, 'State and County Quickfacts': (<http://quickfacts.census.gov/qfd/states/27000.html>).

WEATHER FACTORS

Precipitation

Precipitation data was obtained from the Minnesota Climatology Working Group, State Climatology Office – DNR Division of Ecological and Water Resources and accessed through the following website: (<http://climate.umn.edu/wetland/wetland.asp>). Through the website, a wetland location was selected using a ZIP code rather than city name. For those cities with more than one ZIP code within city boundaries, one ZIP code was chosen by using the following factors: (1) most land area within city boundaries, (2) highest population, (3) highest population density. For many cities, these three criteria overlapped; in all other cases, the ZIP code containing the highest population was chosen. City boundary maps with overlaid ZIP code boundaries can be found at the website (<http://www.city-data.com>). The ZIP codes chosen for each city are specified in both the 'Initiative Summary' tab and the 'Precipitation and Water' tab in each city's data spreadsheet.

DATA GAPS + POSSIBILITIES FOR IMPROVEMENT:

For a more accurate estimation for cities with multiple ZIP codes, precipitation data for each ZIP code within the boundaries of each city could be averaged as a ratio of their relative population within the city. This method was tested for this Initiative, and it was found to make minimal difference due to the relatively small variation in precipitation data between neighboring ZIP codes.

Heating Degree Days (HDD) & Cooling Degree Days (CDD)

Degree days are a simplified representation of outside air-temperature. They are widely used in the energy industry for calculating the effect of outside air temperature on building energy consumption. The following definition is from DegreeDays.net:

"Heating degree days", or "HDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was lower than a specific "base temperature" (or "balance point"). They are used for calculations relating to the energy consumption required to heat buildings.

"Cooling degree days", or "CDD", are a measure of how much (in degrees), and for how long (in days), outside air temperature was higher than a specific base temperature. They are used for calculations relating to the energy consumption required to cool buildings.

For the United States, the HDD for a day is calculated as the difference in degrees of the average of the day's high and low temperatures from a base temperature of 65 degrees Fahrenheit. For example, if the day's high temperature is 60 and the low is 40, the average temperature, 50 degrees, minus 65 equals 15 heating degree days. The calculation for CDD is similar using the average high/low temperature above the 65-degree base temperature.

Both Heating Degree Days and Cooling Degree Days data was obtained from the website: DegreeDays.net. Degree Days.net data is based on temperature data from weather stations worldwide. To access the data, the RII team first searched for the ZIP code of the city hall for each city, and then selected the weather stations at the top of the list (the weather station data is sorted by DegreeDays.net so that the most accurate data is listed first). The weather station chosen for each city is listed on the 'HDD & CDD' and 'Initiative Summary' tabs of each city's data spreadsheet.

ENERGY

Electricity data

Electricity data was obtained with the cooperation of local utility companies. Using a template letter provided by the Regional Indicators Initiative team, each individual city requested annual electricity data from their respective utility and then forwarded it to the RII team. The utility companies providing data vary from city to city; these sources are listed on the individual city's data spreadsheets under both the 'Initiative Summary' tab and the 'Energy' tab.

During the pilot phase of this Initiative, it was found that utility companies can disaggregate electricity data into residential use and commercial/industrial use. For example, electric data received from Xcel Energy was broken down into the following categories: Residential, Residential Windsource, Commercial & Industrial, C&I Windsource, and Public Street and Highway Lighting. Other utilities, such as Rochester Public Utility, provided this data broken down into only two categories Residential and Commercial Industrial. Xcel Energy provides the following definition of 'Residential' and 'Commercial/Industrial' customers:

"A residential customer is one using electric service for domestic purposes in space occupied as living quarters such as single private residences, duplex units, townhouse units, condominium units, apartment units, mobile homes, fraternity houses, sorority houses, and rooming houses. Domestic purposes or uses are domestic lighting, heating, cooking, and power service." Other consumption is in the Commercial/Industrial category and the small Public Street and Highway Lighting category."

There can be a lot of "cross-over" between the residential and the commercial classifications in a single building. Consider this further clarification of Xcel Energy's methods of classification: "Apartment buildings often have individual electric meters for each unit, which are served on a residential rate and are included in the electric Residential class of service. They usually have another electric meter for laundry rooms and for common area

lighting and cooling, served on a commercial electric rate and included in the Commercial class. These same apartment buildings often have one gas meter connected to a boiler and a water heater providing heat and hot water to all of the individual units. These meters are served on a commercial gas rate and are included in the gas Commercial class. However, if each unit has an individual gas meter serving only that unit's individual furnace and/or water heater, then it is served on a residential gas rate and included in the gas Residential class."

In the case of the Duluth Steam Utility, this district energy system provides approximately 12% of its steam energy to buildings with multifamily units and mixed commercial/residential uses. The rest goes to non-residential uses. The spreadsheet file for the City of Duluth allocates the related emissions, energy, and costs accordingly.

In order to maintain consistency during this RII data collection process, electricity data was classified as either 'Residential' or 'Commercial/Industrial'. The classification 'Residential' is the sum of both Residential and Residential Windsource where applicable. The classification 'Commercial/Industrial' is the sum of Commercial, Commercial Windsource, and Public Street and Highway Lighting where applicable.

Several cities are hosts to major facilities that serve populations outside the city's boundaries (power plants, major airports, garbage incinerators, and wastewater treatment plants). For example, the greenhouse gas emissions associated with electricity consumption within Minneapolis already account for the natural gas consumption required to generate the city's share of electricity production at Xcel Energy's Riverside Generating Station, which is located within the city. To avoid double counting, total natural gas consumption at the plant is subtracted from the Minneapolis citywide total.

Natural Gas data

Natural gas data was also obtained via a request from each city to their local utility companies for annual data. The utility companies providing data vary from city to city and are listed on the individual city's data spreadsheets under the 'Initiative Summary' tab and 'Energy' tab.

As per the request letter, natural gas data was consistently received broken down into 'Residential' and 'Commercial/Industrial' categories from all utility companies. Similar to electricity, any natural gas used by a 'shared' facility (i.e. power plant, wastewater facility, etc.) was subtracted from the commercial/industrial total to avoid double counting of these values and ensure that 'total energy' is defined as the *share* of energy consumed by each city.

Total Energy

The carbon baseline assessment prepared for the cities excludes several emission sources that are sometimes included in other assessments, such as emissions associated with marine and railroad operations, refrigerant and fire suppressants leakage, agricultural and livestock operations, and minor combustors of liquid fuels (e.g. fuel oil, propane, and diesel-powered heaters) because they were found to be less than five percent of the total and therefore 'de minimis'. The Minnesota Pollution Control Agency provided 2001 data for liquid fuel and waste wood combustion for the 17 cities in the Initiative for which the Initiative team had data. Only the data for Duluth was included in the assessments. The GHG emissions associated with consumption levels for the other 16 cities were a fraction of 1% and therefore de minimis amounts. The assessment does include major fuel oil users and portside emissions from the Port of Duluth, which can be seen on the Duluth 'Initiative Summary' tab of the spreadsheet.

Because electric data (MWh) and natural gas data (therms) are measured using different units of energy, it was necessary to convert all energy to a common metric – millions of Btus (MMBtu). This conversion allowed for the data to be aggregated into 'Total Residential Energy', 'Total Commercial/Industrial Energy' and 'Total Energy'. In addition, combined with the annual demographic data previously, the Initiative team was able to produce the metrics 'Residential Energy/Person/Day', 'Commercial Energy/Person/Day', 'Residential Energy/Household/Day', 'Commercial Industrial Energy/Job/Day' and 'Total Energy/Capita/Day'. Using the Heating Degree Days (HDD) and Cooling Degree Days (CDD) data, total energy was also normalized by weather (as explained above).

DATA GAPS + POSSIBILITIES FOR IMPROVEMENT:

Another obstacle to obtaining the most accurate electricity data was Xcel Energy's "15/15 Rule:" In September 2012, it was learned that Xcel Energy had instituted a new policy in Minnesota called the "15/15 Rule" that applies when the company responds to a request for consumption data. According to Xcel, the "15/15 Rule" has been adopted by Xcel and several utilities across the country to help protect customers' data privacy when it comes to aggregated reports going to a third

party. The “15/15 Rule” has two main aspects. It prevents the utility from disclosing consumption data to a third party for any customer group with less than 15 customers. For example, if there are only 14 Commercial & Industrial (C&I) customers in a group, the utility cannot release the aggregate consumption data to a third party. The Rule also prevents the utility from releasing data for a group where an individual customer’s data makes up more than 15% of the aggregated group total. For example, if there were 100 C&I customers on the report with an aggregate total consumption of 1,000 kWh and one of those customer’s total was 150 kWh, the utility must remove that customer’s data from the report. The utility must then repeat the process to determine if there is a customer with consumption at 127.5 kWh or more (15% of the remaining 850 kWh).

Xcel stated that the consumption data for the following 11 of the project’s 20 participating cities have data excluded because of the application of the 15/15 Rule (the four cities with excluded electricity and natural gas data are underlined for emphasis):

- Coon Rapids: Commercial/Industrial wind
- Eagan: Commercial/Industrial gas and electric
- Eden Prairie: Commercial/Industrial wind
- Edina: Commercial/Industrial wind
- Falcon Heights: Commercial/Industrial wind and electric
- Maplewood: Commercial/Industrial gas and electric
- Minnetonka: Commercial/Industrial wind
- Oakdale – Residential wind and Commercial/Industrial wind and gas
- Richfield: Commercial/Industrial wind
- Shoreview: Residential and Commercial/Industrial wind
- St. Louis Park: Commercial/Industrial wind
- White Bear Lake: Residential and Commercial/Industrial wind

The excluded wind-based consumption is not likely to comprise a significant portion of overall consumption (probably less than 1%) and its exclusion has no effect on GHG emissions. The Assessments for these cities disclose the facts of this missing data. For the four cities where Xcel has withheld data for natural gas or non-wind-generated electricity due to the “15/15 Rule,” the extent to which the disclosed data undercounts the actual data and for which years the rule was applied is not known. As such, the validity of this reported data is questionable.

WATER

Total Annual Potable Water Consumption data was obtained directly through each Initiative city. The Regional Indicators Initiative team requested potable water distribution amounts from each city broken into two main categories: Residential and Commercial/Industrial. Data was received in a variety of formats. Cities that depend primarily on wells sent Minnesota Department of Natural Resources (MN DNR) withdrawal reports with consumption broken down into categories of Residential, Commercial, Industrial, Agricultural and ‘Other’ (which was designated Institutional in some cases). All other city potable water data, however, was reported with slightly different aggregations and ‘Totals’. For example, some cities submitted totals for only ‘Residential’ and ‘Commercial/Industrial’, while others submitted data in addition categories (e.g. irrigation, institutional, city use). The RII team categorized Residential potable water as ‘Residential’, and all other data as ‘Commercial/Industrial’.

DATA GAPS + POSSIBILITIES FOR IMPROVEMENT:

Some of the submitted data indicated that ‘City Water’ had been excluded, creating a possible inconsistency. City water represents water meant for city operations and was added to the Commercial/Industrial category when available.

An additional inconsistency concerned which totals were reported. For some cities, it was unclear whether ‘Total potable water’ was being defined as ‘Total Gallons Sold’ (which represented actual consumption) or ‘Total Reported Withdrawals’ (which represented consumption plus any leakage or losses of water throughout distribution). Where both totals were represented, ‘Total Gallons Sold’ was chosen to best represent consumption. It is unclear in most cases outside of cities who submitted DNR data whether the data represented ‘Total Gallons Sold’.

Finally, several people have asked ‘Why not include DNR data on private well water use?’. The Initiative team needs to clarify whether well water was included, or only for select cities.

Because of the possible discrepancies apparent in this process of collecting data from 20 individual sources, the Initiative team is currently working to obtain annual potable water data for all cities across the study period from the Metropolitan Council as well as from Minnesota DNR. Through cross-referencing these data sources, the Initiative team is hoping to reveal any inconsistencies and better refine the values.

A future possibility would be to ask cities to report monthly data, which would allow water used for irrigation to be estimated as well.

TRAVEL

Data for vehicle miles traveled (VMT) within the boundaries of each city was obtained from Minnesota Department of Transportation, and accessed through the MN DOT website: (<http://www.dot.state.mn.us/roadway/data/reports/vmt.html>). This website allows the data to be aggregated in many ways, and the RII team used 'VMT by County/City/Route System' for the years 2008, 2009, and 2010. Data for 2011 is not yet available, per the advice of MNDOT staff, 2010 data is assumed to be stable for 2011 until actual 2011 data is available. Miles of roadway vary slightly over time as designations of roads change. The figures listed for 2008 mileages are used across the study period for the RII calculations.

MN DOT provided data as 'Daily (Average) Vehicle Miles', 'Annual (Total) Vehicle Miles' and 'Centerline Miles'. The RII team used the 'Annual (Total) Vehicle Miles' data set.

Currently, the Regional Indicators Initiative defines annual VMT as the sum of all mileage on routes within the boundaries of a given city. MN DOT VMT data is collected to the detail of each route type and is broken down into the following categories; Interstate Trunk Highway, US Trunk Highway, Minnesota Trunk Highway, County State Aid Highway, Municipal State Aid Highway, County Road and Municipal Street.

DATA GAPS + POSSIBILITIES FOR IMPROVEMENT:

This data has been collected as both a sum of all route types and for each individual route. However, only the total VMT was used for data analysis in the scope of this project. Analyzing the data as it is broken down by route type would help to identify the various factors which contribute to total VMT. For example, cities that have a majority of mileage on freeways could be identified as 'pass-through cities' rather than destination cities. This fine-grained analysis of travel data could help to identify how cities of various types can improve their transportation systems and reduce their annual VMT.

Additionally, a revisit of in-boundary vs. trans-boundary vehicle counting is in order, especially as we get more MN cities and as nationally people find they can't compare RII numbers to "ICLEI" (WRI) protocol numbers. Micheal Orange's response: "I'm still befuddled why the demand method, as calculated by Mark Filipi, yields VMT figures that run counter to every study I've ever seen that document the significant inverse relationship of density to VMT. We can ask Mark to generate the other study years (he gave us 2010) and I can add them to the reports if you want and use the results in the city totals. I still think it's worthwhile to keep the polygon method results because, with 11 years of data, we can show the long-term trends for each city."

WASTE

Municipal solid waste (MSW) is defined by statute as garbage, refuse, and other solid waste from residential, commercial, industrial, and community activities that the generator of the waste aggregates for collection. It does not include auto hulks, street sweepings, ash, construction debris, mining waste, sludge, tree and agricultural wastes, tires, lead acid batteries, motor and vehicle fluids and filters, or other materials collected, processed, and disposed of as separate waste streams (Minn. Stat. § 115A.03, subd. 21).

Annual Municipal Solid Waste (MSW) data was obtained from the Minnesota Pollution Control Agency (MPCA) SCORE reports, and was accessed through the MPCA website found here: (<http://www.pca.state.mn.us/index.php/data/score/recycling-and-solid-waste-data.html>).

The data set includes Recycling, Solid Waste-Landfilled, Solid Waste-Resource Recovery and Composted values broken down by specific facility for all Minnesota counties dating back to 1991. No cities participating in the RII study included values for composted waste because associated biogenic emissions are not counted as part of the community's carbon 'footprint'. The totals within the three primary waste breakdown categories (Recycled, Landfilled and Incinerated) are obtained by summing all facility totals within each category.

DATA GAPS + POSSIBILITIES FOR IMPROVEMENT:

Unfortunately, comprehensive municipal solid waste data is not currently aggregated by city, but only by county. To accommodate for this discrepancy in aggregation, per-capita amounts by waste management method for the county are used to estimate per-capita amounts for the city. It is assumed through this data aggregation that, on a per-capita basis, city waste will be generated and managed at the same rates as those measured for the county.

Over the course of this study, several cities have indicated that they are working towards collecting and reporting city-specific municipal solid waste data. Updated values for each city could be integrated at a later date.

CARBON BASELINE ASSESSMENTS

In order to compare the Regional Indicators Initiative's four primary indicators (Energy, Water, Travel and Waste) the data has been translated into both greenhouse gas (GHG) emissions as well as total retail cost associated with each indicator. While the focus of this report is to document the data sources, methods, assumptions and possibilities for improved data collection, the process of creating carbon baseline assessments and determining costs associated with consumption is described in detail in a separate document.