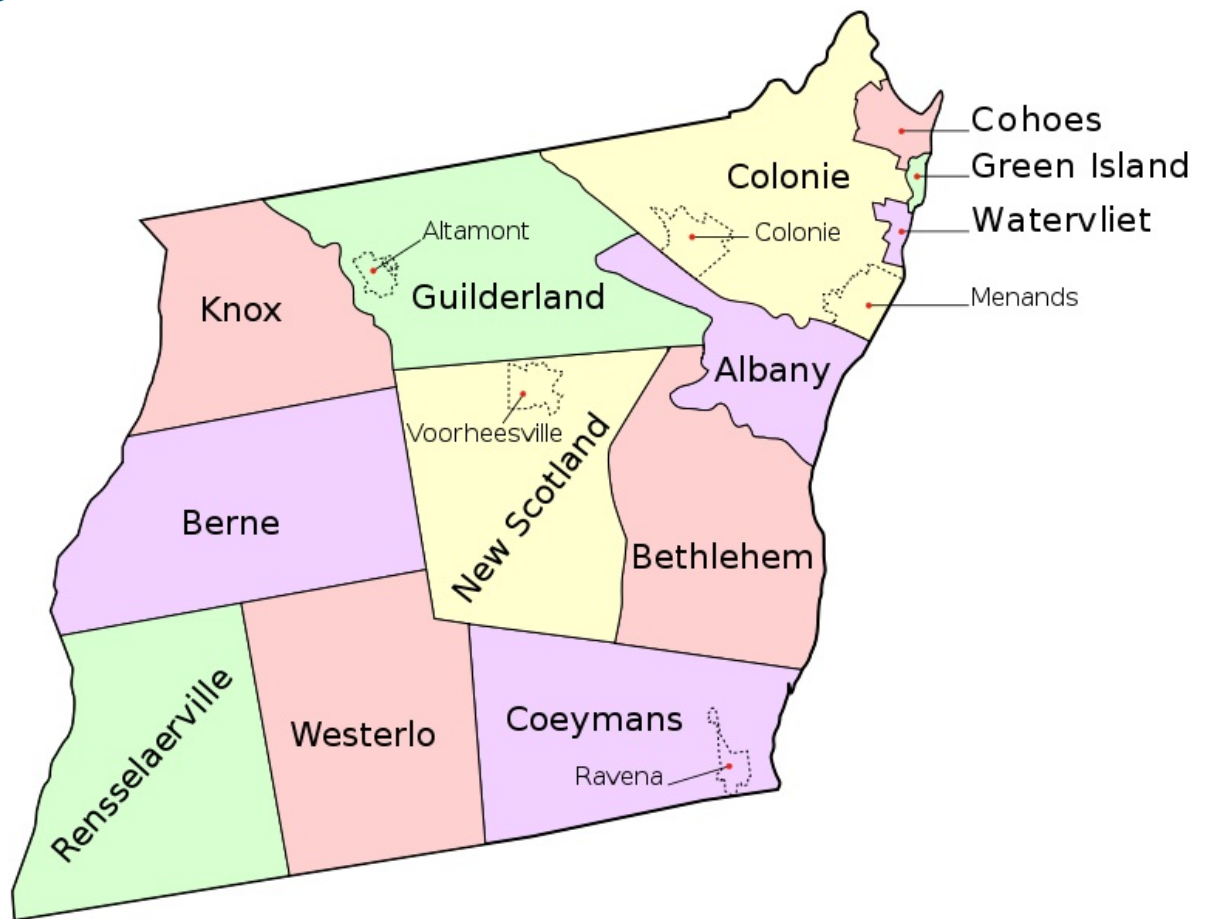


Albany County

2010 GHG Inventory

County and Municipal Inventories



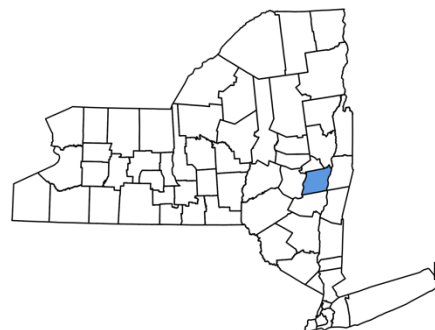
*Compiled by Climate Action Associates LLC,
Jim Yienger on 3/20/2012*

*Report prepared by
The Capital District Regional Planning Commission (CDRPC)
6/2021*

*Administered by the US Department of Energy and
the New York State Energy Research and Development Authority*

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Notice

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Acknowledgements

This report is made possible by the *Capital District 2010 Regional GHG Inventory*, which was prepared for The New York Energy Development and Research Authority (NYSERDA) by The Capital District Regional Planning Commission (CDRPC) and Climate Action Associates LLC. The Regional Inventory covers 2010 data and was published in 2013.

Community Greenhouse Gas (GHG) Framework Development

As part of the NYSERDA-funded Climate Smart Communities Regional Coordinators Pilot Program, the Capital District Regional Planning Commission (CDRPC) and its consultant Climate Action Associates developed a [Greenhouse Gas \(GHG\) Emissions Inventory](#) of the Capital Region, which is available for public viewing on CDRPC's website. This report utilizes the data found in the 2010 Regional Inventory for Albany County.

This GHG inventory was commissioned by the Capital District Regional Planning Commission (CDRPC) and covers all major GHG sources in the eight-county Capital District Regional Economic Development Council (REDC) region. It was developed to support communities participating in the Climate Smart Communities (CSC) program.

Albany County is using the data from the regional report to develop a baseline GHG inventory and subsequent Climate Action Plan as part of the Climate Smart Communities pledge.

This report is primarily a GHG baseline and is not intended to cover the options available to reduce GHG emissions in the region. However, it does include policy scenarios to show how alternative fuels and vehicles may reduce emissions from the transportation sector. It also includes a detailed study of how household energy use varies across the region to help planners identify strategies to engage households in local sustainability efforts.

Creating a greenhouse gas (GHG) emissions inventory baseline is an important component of long-term sustainability planning. All GHG emissions in this report are reported in units of **Metric Tons**

Carbon Dioxide Equivalent (MTCDE) which is the convention for reporting regional GHG inventories. One MTCDE is equal to 1000 kgs of CO₂. Non-CO₂ GHGs are first converted to an equivalent amount CO₂ using a global warming potential (GWP) unique to each gas as defined in the Intergovernmental Panel on Climate Change (IPCC) Second Assessment Report. Table 1 shows the GHG Accounting Framework created by the GHG Working Group and identifies the complete listing of all sources included in the study.

Scopes-Based GHG Accounting

GHG sources organize sources of GHG emissions by levels of “Scope”:

- **Scope 1:** (direct) emissions that physically occur within the regional or community boundary such as those emitted by burning natural gas or fuel oil in homes and businesses; or
- **Scope 3:** (indirect) emissions *attributed* to region or community activities that cause emissions whether the emissions physically occur in-boundary or not. **Scope 2** is a special category of emissions to attribute a share of regional power plant emissions to individual communities based on how much electricity they use.

Scopes based accounting allows a community to have *both* Scope 1 and 3 emissions for what the same source is essentially. For example, communities with electric power stations have very large Scope 1 sources from fuel burned by the power plants inside the community. Power plants, however, do not supply electricity to communities directly. They supply the electricity grid. Therefore, communities will also have separate Scope 2 emissions based on (1) the amount of electricity they consume and (2) on the average carbon intensity of all the plants supplying the regional grid. In solid waste the City of Albany has a scope 1 GHG emissions from landfills. However, Albany is assigned a separate Scope 3 emissions based on how much waste they produce and send for disposal to landfills and waste-to-energy plants.

Scopes accounting can inherently double count, so they are never added together. The point of organizing inventories by scopes is to empower stakeholders to reduce emissions they influence. Therefore, power plant and landfill operators can record GHG reductions against community Scope 1 footprints, whereas municipalities can tie community-wide energy and waste reduction efforts against their Scope 2 and 3 footprints.

Albany County 2010 GHG Emissions

Albany County is one of the eight counties of the Capital District. In 2010, Capital District greenhouse gas (GHG) emissions were 15.8 million MTCDE (Metric Tons Carbon Dioxide Equivalent), or 14.7 MTCDE/person. Fossil fuels created 84% of the emissions. Across the counties, as shown in Figure 1 below, Albany has the highest greenhouse gas emissions by counting – amounting to about 5 million MTCDE and 32% of all emissions in the region. This is primarily because Albany County has the region’s highest populations and larger concentrations of commercial and industrial activities.

Fig. 1 GHG Emissions by County (MTCDE)

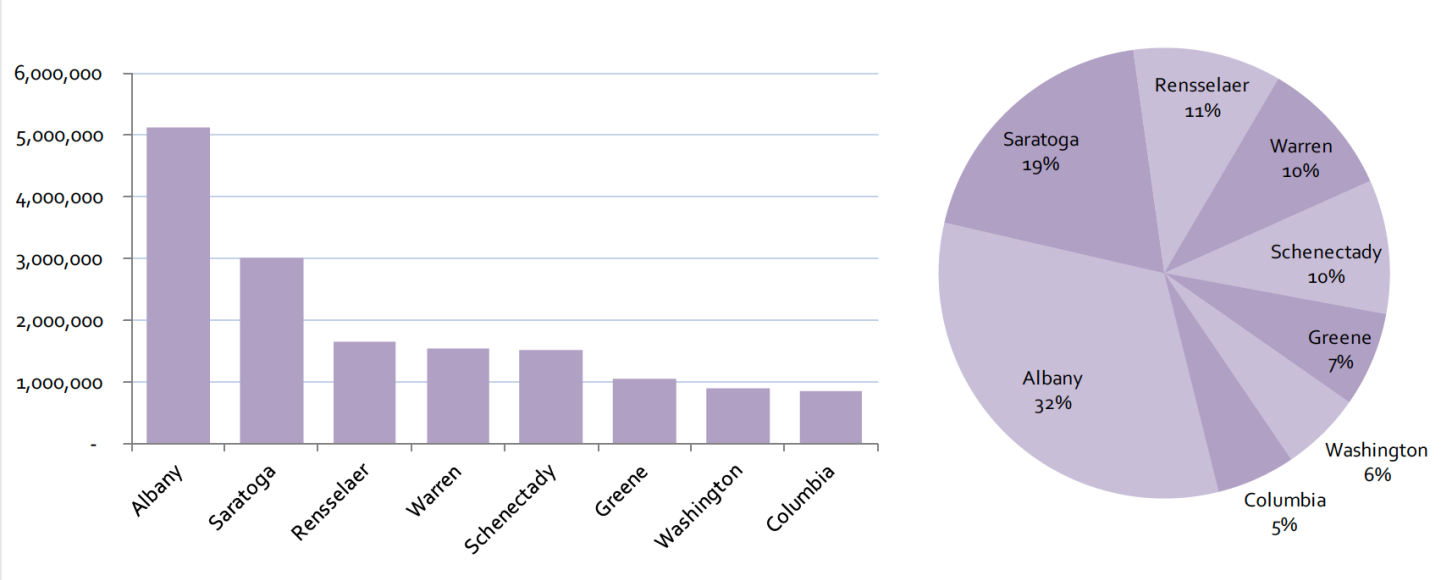
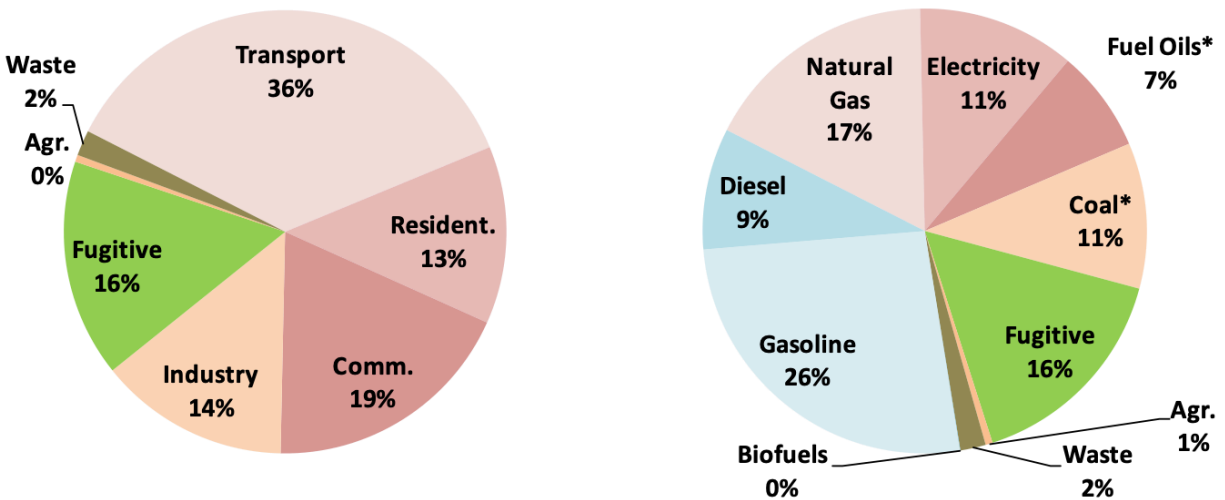


Fig. 2 Albany County GHG Emissions by Source and Sector

Albany County 5,146,057 MTCDE



The Built Environment: Residential, Commercial, and Industrial Energy Consumption

Fuels and energy used in homes, businesses, and industry are combined the largest source of GHG emissions in the Capital District. They include:

- Scope 1 direct emissions from burning natural gas, coal fuel oils (#1, #2, #4, #5, #6), kerosene, propane, used oils, petroleum coke, motor gasoline, other petroleum products.
- Scope 2 emissions attributed to electricity consumption.
- Biogenic CO₂ emissions from wood and bio-methane combustion.

Table 3 below shows a breakdown of GHG emissions by sector for Albany County.

Table 3. GHG Emissions by Sector and Scope (MCTDE)

County	Residential			Commercial			Industrial		
	Scope 1	Scope 2	Biogenic	Scope 1	Scope 2	Biogenic	Scope 1	Scope 2	Biogenic
Albany	484,926	181,769	73,093	405,759	310,454	24,410	859,067	98,676	12,763

There is a small amount of fuel oil contributing to emissions in Albany County compared to other counties in the Capital District region. This is because grid-supplied natural gas varies by county based on availability. Figure 4 below shows the emissions for Albany County, totaling 5,146,057 MTCDE and about 17 MTCDE per person. Urban density contributes to emissions, despite lower transportation and residential energy use.

Table 4. Albany County Emissions (MTCDE/person)

County	Emissions	Emissions per Capita (MTCDE/person)			
	(MTCDE)	Total	res / com	Industrial*	Transport
Albany	5,146,057	16.9	4.8	5.5	6.1

*Industrial includes process emissions

Electricity and fuel consumption data was collected or estimated in units of MMBTU (Million British Thermal Units) and converted into GHG emissions using methods recommended by GHG Working Group (NYSERDA, 2013).

Natural gas and electricity

Industrial facility emissions can be large and dominate emission inventories, and therefore, it is important to engage these stakeholders as part of sustainability planning. Below, Table 5 shows detailed data on all Albany County point sources. A point source within this context is defined as an identifiable location that emits a substantial amount of greenhouse gases. Lafarge, Inc. cement plant in the Village of Ravena accounts for 20% of Albany County's entire GHG inventory, emitting roughly the same as all emissions sources from the City of Albany combined. Within the City of Albany, the Office of General Services (OGS) Sheridan Steam Plant facility that heats the Empire State Plaza accounts for 50% of the city's industrial sector GHG inventory.

Table 5. Industrial GHG Point Sources in Albany County

Facility Name	Industry	Municipality	GHG Emissions (MTCDE)			
			Scope 1	Bio	Process	Total
Lafarge Building Materials, Inc.	Cement	Ravena	524,461	0	544,401	1,068,862
Albany Rapp Rd. Landfill	Landfill	Albany	78	9,748	67,190	67,268
Colonie Town Landfill	Landfill	Cohoes	95	19,598	55,209	55,304
Sabic Innovative Plastics US LLC	Paper	Selkirk	53,332	0	0	53,332
Owens-Corning Insulating Systems	Chemical	Feura Bush	23,856	0	0	23,856
Norlite Corp	Cement	Cohoes	10,724	0	0	10,724
Buckeye Albany Terminal LLC	General Industry	Albany	8,950	0	0	8,950
Global Companies LLC	General Industry	Albany	58	0	0	58
Citgo Petroleum Glenmont Terminal	Energy Distr.	Glenmont	18	0	0	19

Facility emissions are large and can represent a major portion of county and local emissions.

Household Energy, Land Use, and GHG Emissions

Capital District GHG emissions are driven by a nexus between the residential and transportation sectors. The residential sector is the largest of the “RCI” sectors (residential, commercial, industrial) and transportation is the single largest sector overall. They are linked because while households create energy demand for domestic heating and cooling, household residents create transportation demand that forms the majority of on-road transportation GHG emissions. Together how much an individual household and its residents contribute to GHG emissions depends upon household size and efficiency, choice of heating fuels, community land use patterns, proximity to work, and accessibility of transit.

The study evaluated the following per-household metrics for each municipality:

Domestic energy use: The sum total of all electricity, gas, fuel oil, and wood used in a household reported in MMBTU. This energy data comes directly from the GHG inventory and utility-supplied data.

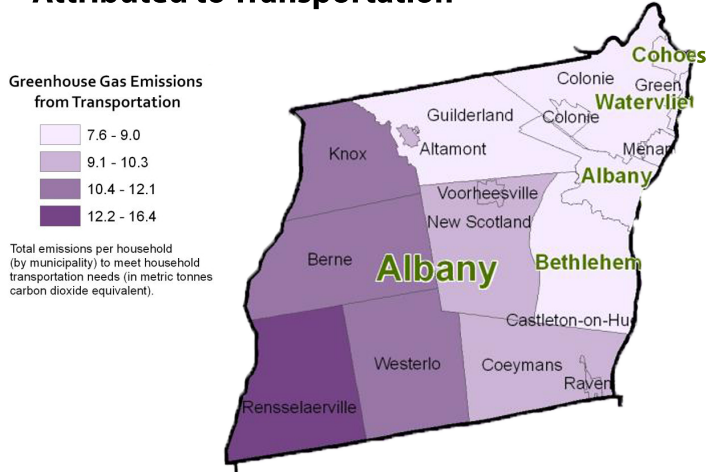
Attributed transportation energy use: This is an estimate of fuel use attributed to households to meet transportation needs (i.e., directly through fueling of personal vehicles or indirectly through use of transit.) To estimate it, it was assumed that Capital District households consume at the national average rate of 132 MMBTU/household. Half of that rate was assigned to municipalities by default and the balance was apportioned weighted to average community commute time reported in the American Community Survey. This method ensures that the average household rate remains 132 over the whole region, but allows communities with longer commutes to receive more energy than those with shorter commute times.

Attributed GHG footprint: Total GHG emissions attributed to a household for meeting both its domestic energy and transportation energy needs. The calculation assumes for simplicity that all transportation energy is conventional motor gasoline.

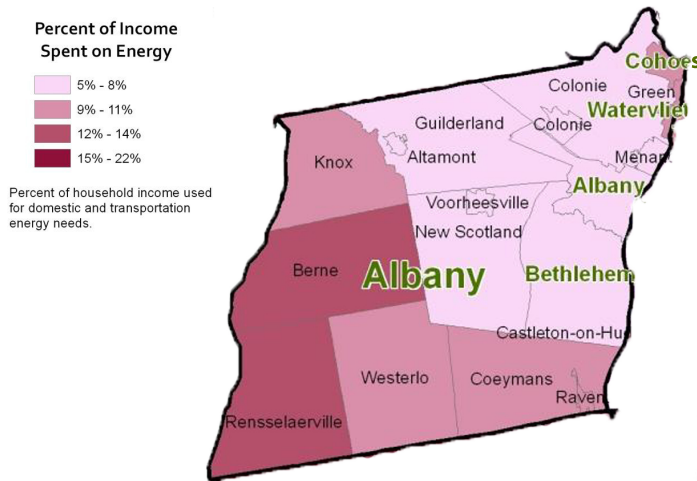
Energy Cost of Living (ECOL): The total cost for all energy paid by households to meet domestic and transportation needs. ECOL is compared with household incomes to determine how the energy cost burden varies across the counties and municipalities.

Maps depicting each of these for municipal household metrics are shown for Albany County below.

GHG Emissions per Household Attributed to Transportation



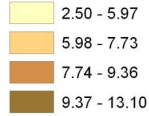
Energy Cost of Living as a Percent of Income



Prepared by:
The Capital District
Regional Planning Commission
April, 2013

GHG Emissions per Household Attributed to Domestic Energy Use

Domestic Greenhouse Gas Emissions



Total household emissions from natural gas, fuel oils, wood, and propane consumed in each municipality (in metric tonnes carbon dioxide equivalent).



Energy Cost of Living (ECOL) per Household

Energy Cost of Living

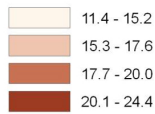


Total cost of household energy for domestic and transportation needs.

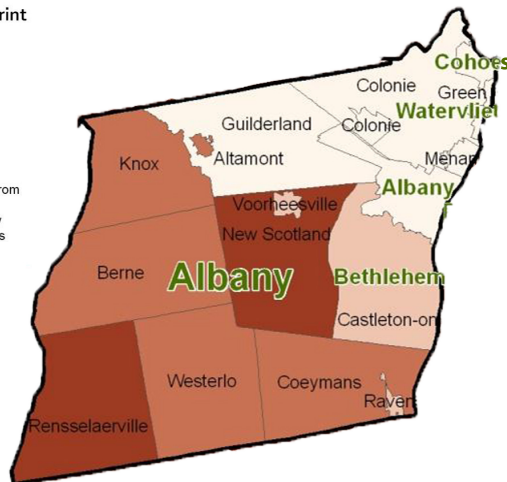


GHG Emissions per Household

Greenhouse Gas Footprint (MTCDE)



Total household emissions from motor vehicle use combined with domestic energy use by municipality (in metric tonnes carbon dioxide equivalent).



Albany County is one of the counties in the Capital District that consumes the least domestic and transportation energy. The county also spends less on energy. Due to its compact and urban nature, residents of Albany County have shorter commute times and more households reside in multifamily buildings.

GHG Emissions and Electricity Use

When communities use grid electricity, they create Scope 2 emissions at regional power plants based on fossil carbon-intensity of the electricity. Below is a chart that compares electricity generation versus consumption in Albany County.

Albany County: Electricity Generation vs. Consumption (MTCDE)

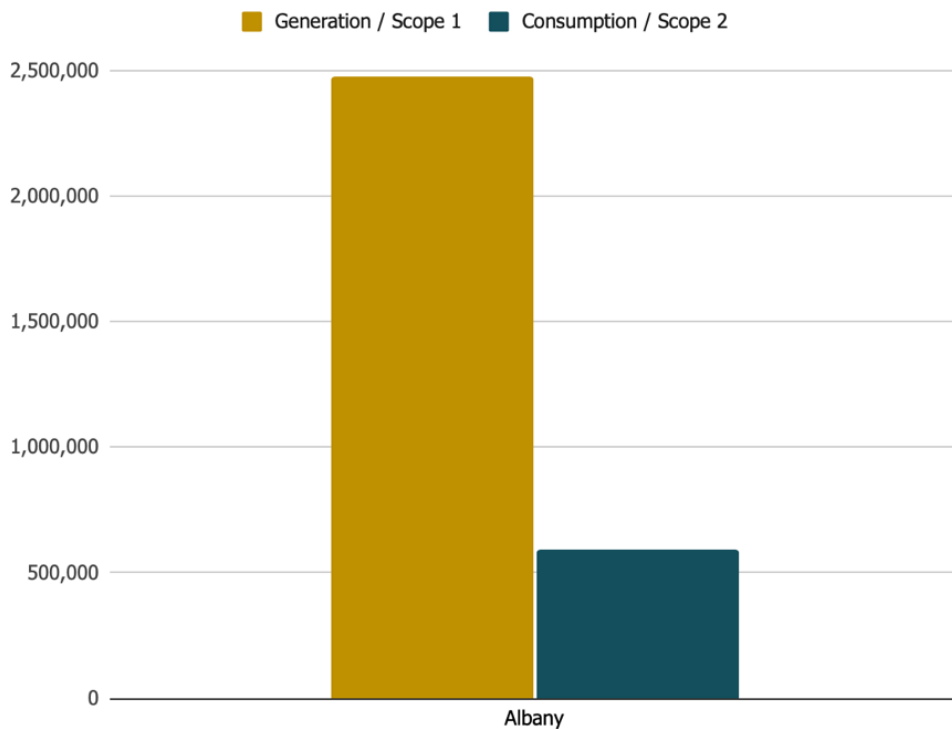


Fig. 4 Electricity Generation vs. Consumption (MTCDE)

Capital District 2010 Regional GHG Inventory

Climate Action Associates LLC

Albany County GHG Emissions 2010

5,146,057 MTCDE

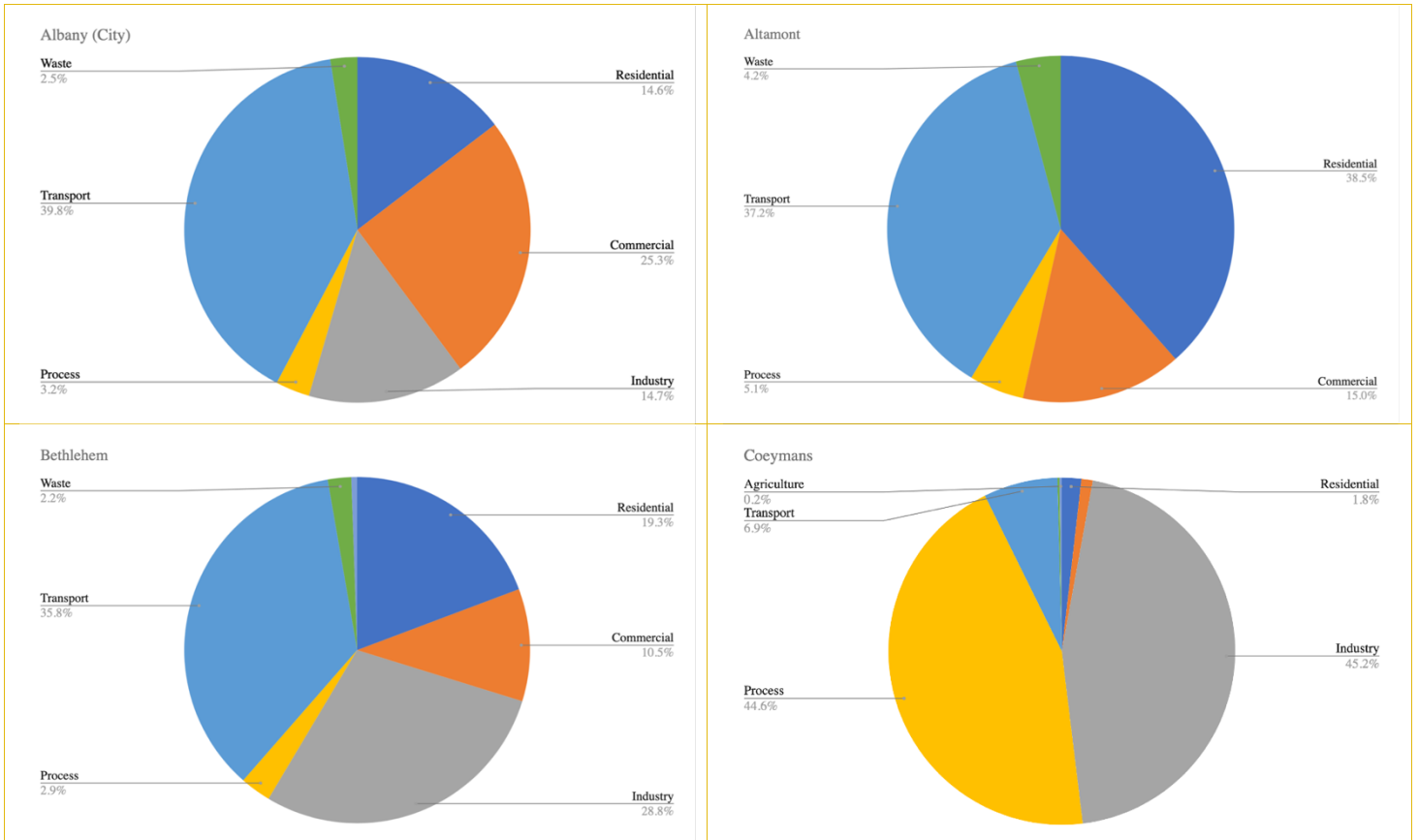
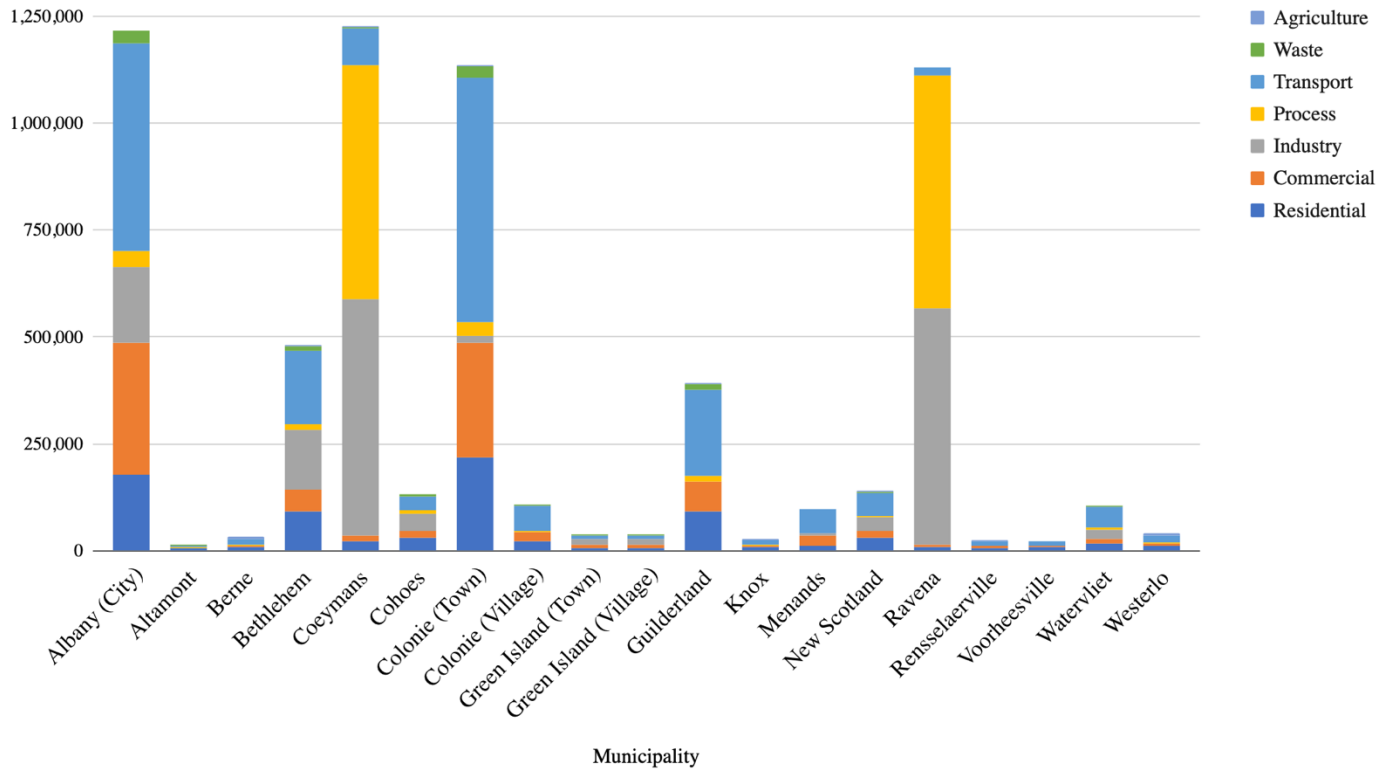
Sector / Source	GHG Emissions (MTCDE)					Energy
	Scope 1	Scope 2	Scope 3	Biogenic	Rolled up?	(MMBT)
Residential Energy Consumption						
Electricity / Steam		181,769			Yes	2,701,766
Natural Gas	346,111				Yes	6,521,529
Propane / LPG	16,575				Yes	268,603
Distillate Fuel Oil (#1, #2, #4, Kerosene)	120,077				Yes	1,618,099
Coal	625				Yes	6,638
Wood	1,538			73,093	Yes	779,240
Commercial Energy Consumption						
Electricity / Steam		310,454			Yes	4,614,493
Natural Gas	281,503				Yes	5,304,172
Propane / LPG	7,879				Yes	127,679
Distillate Fuel Oil (#1, #2, #4, Kerosene)	58,403				Yes	787,002
Residual Fuel Oil (#5 and #6)	57,362				Yes	761,283
Coal	99				Yes	1,050
Wood	514			24,410	Yes	260,235
Industrial Energy Consumption						
Electricity / Steam		98,676			Yes	1,466,684
Natural Gas	254,734				Yes	4,799,783
Propane / LPG	1,073				Yes	17,001
Distillate Fuel Oil (#1, #2, #4, Kerosene)	12,769				Yes	172,070
Residual Fuel Oil (#5 and #6)	3,936				Yes	52,235
Coal	496,057				Yes	5,270,079
Petroleum Coke	48,468				Yes	472,122
Motor Gasoline (E-10)	6,456				Yes	91,617
Other Oils	35,307				Yes	475,518
Wood	269			12,763	Yes	136,065
Energy Generation and Supply						
Natural Gas	2,477,641				No	104,780,116
Distillate Fuel Oil (#1, #2, #4, Kerosene)	1,346				No	25,004
MSW	0			0	No	1,592,624
Landfill Gas	145			28,820	No	553,480
Electricity T/D Losses	30,692				Yes	463,739
Natural Gas T/D Losses	121,248				Yes	299,259
Industrial Processes						
Cement Production	544,401				Yes	
Pulp and Paper Manufacturing	0				Yes	
Product Use (HFC, ODS)						
Use of SF6 in the Utility Industry	8,090				Yes	
All Refrigerants- except SF6	112,914				Yes	
Transport: On-Road						
Motor Gasoline (E-10)	1,309,225			94,935	Yes	19,964,739
Diesel	187,525				Yes	2,485,457
Ethanol (E-85)	N/A				No	
Biodiesel	N/A				No	
Transport: Rail, Marine, Off-Road, Air						
Motor Gasoline (E-10)	32,317			3,487	Yes	509,507
Diesel	116,649				Yes	1,546,064
Residual Fuel Oil (#5 and #6)	59,882				Yes	794,725
Natural Gas	917				Yes	17,277
Propane / LPG	9,415				Yes	148,903
Jet Kerosene (Air)			150,131		Yes	1,989,840
Waste Management						
Landfill Methane	122,399		60,836		Yes (S3)	
MSW incineration			5,064		Yes (S3)	
Sewage treatment	29,554				Yes	
Agriculture						
Enteric Fermentation / Manure	13,536				Yes	
Soils / Fertilizer	13,008				Yes	
Totals by Scope	6,940,658	590,899	216,032	237,507		171,875,698

Municipal Level

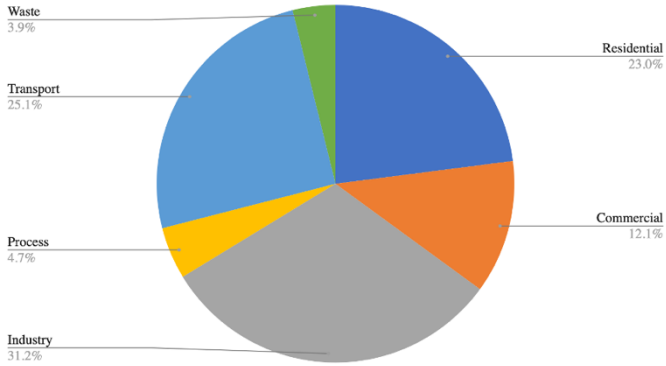
For each municipality, electricity and fuel consumption data was collected or estimated in units of MMBTU (Million British Thermal Units) and converted into GHG emissions using methods recommended by GHG Working Group (NYSERDA, 2013). Emission levels and source breakdowns vary across Albany County's municipalities.

Municipality	Residential	Commercial	Industry	Process	Transport	Waste	Agriculture	Muni Totals
Albany (City)	177,473	307,650	178,464	38,796	484,002	30,706	0	1,217,091
Altamont	4,993	1,947	0	661	4,830	540	0	12,971
Berne	8,511	3,969	0	1,077	13,962	877	3,430	31,826
Bethlehem	92,935	50,595	138,831	13,881	172,674	10,561	2,626	482,103
Coeymans	22,213	13,040	554,492	547,297	84,755	2,328	2,685	1,226,810
Cohoes	30,149	15,843	41,022	6,184	33,003	5,073	0	131,274
Colonie (Town)	216,847	270,913	14,404	32,714	573,016	25,602	2,997	1,136,493
Colonie (Village)	21,818	21,028	0	3,097	58,995	2,445	0	107,383
Green Island (Town)	5,840	8,160	12,882	1,115	8,114	822	0	36,933
Green Island (Village)	5,840	8,160	12,882	1,115	8,114	822	0	36,933
Guilderland	91,299	69,965	219	13,904	202,311	11,077	3,102	391,877
Knox	8,291	3,645	0	1,031	11,512	845	2,237	27,561
Menands	10,208	25,958	4,209	1,691	54,997	1,252	0	98,315
New Scotland	30,424	15,413	31,847	3,365	54,459	2,714	3,080	141,302
Ravena	8,963	5,654	551,922	545,672	17,709	1,025	0	1,130,945
Rensselaerville	7,076	3,317	47	715	10,966	578	3,292	25,991
Voorheesville	7,699	3,417	0	1,070	9,040	875	0	22,101
Watervliet	17,824	9,905	21,256	4,025	49,672	3,218	0	105,900
Westerlo	11,111	5,147	573	1,300	17,535	1,055	3,096	39,817
Sector Totals	779,514	843,726	1,563,050	1,218,710	1,869,666	102,415	26,545	6,403,626

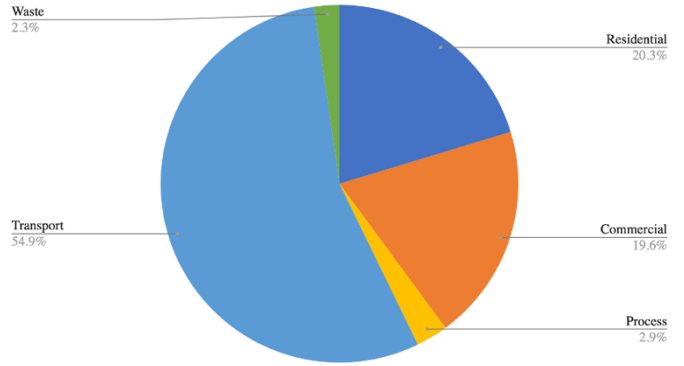
Municipality Emissions by Sector



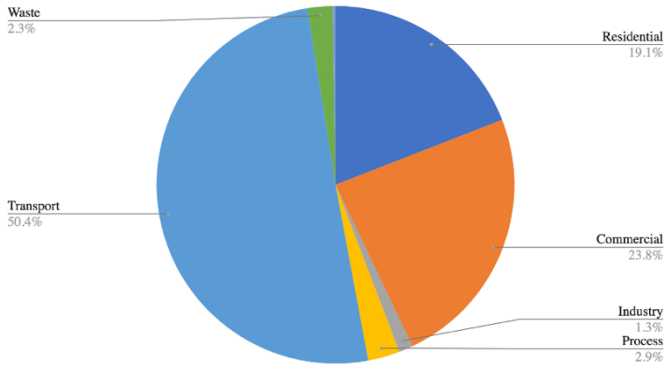
Cohoes



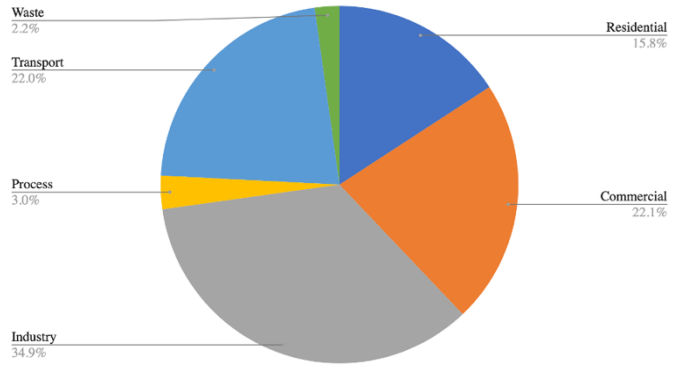
Village of Colonie



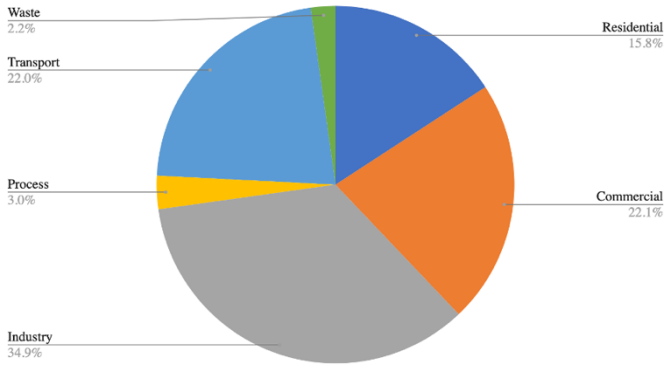
Town of Colonie



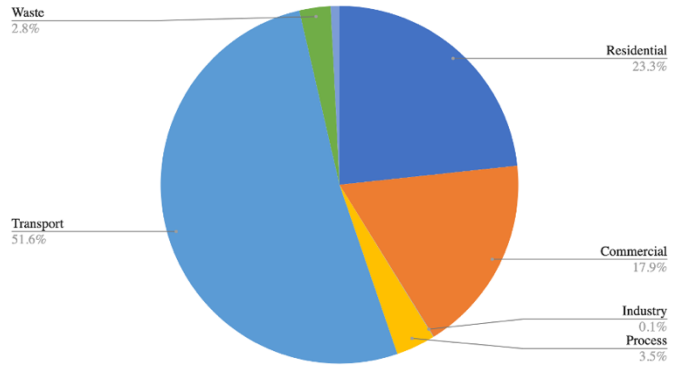
Town of Green Island



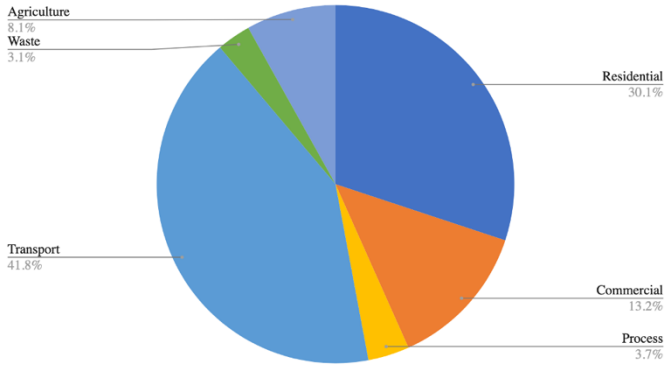
Village of Green Island



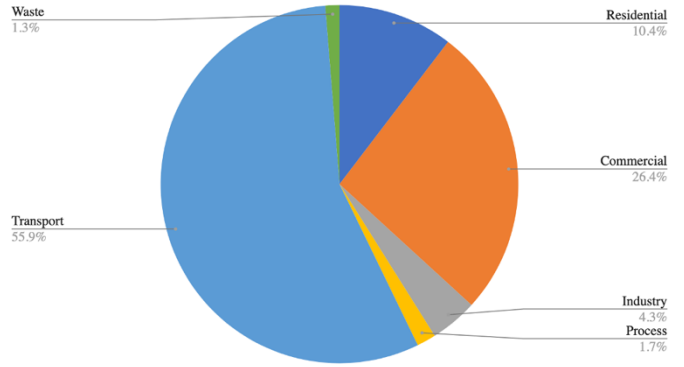
Guilford



Knox



Menands



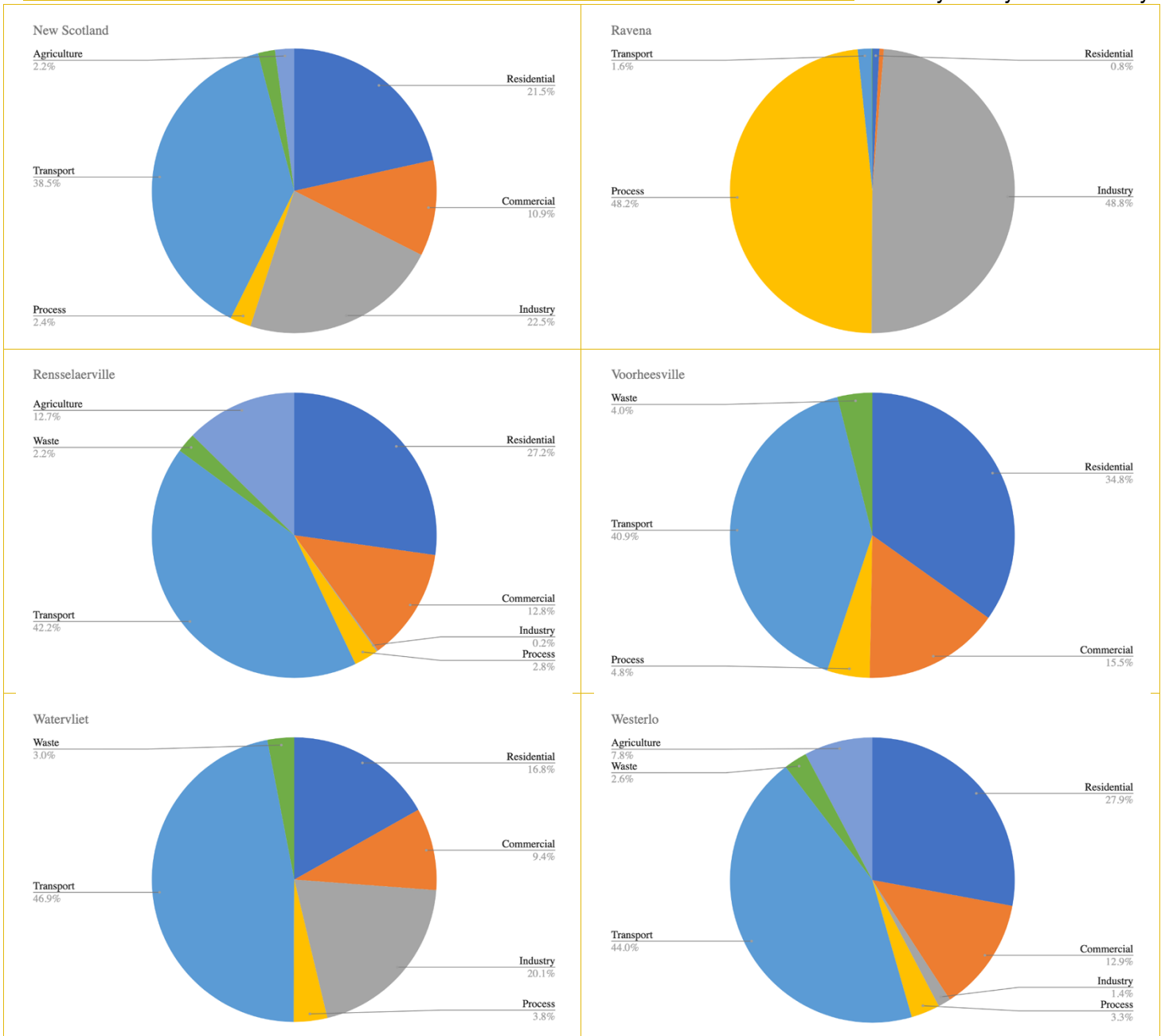


Table B 2. Utility-Supplied Energy Consumption Data for 2010 by Municipality

Municipality	Type	County	Electricity (MWh)				Natural Gas (Therms)			
			Total	Res.	Com.	Indust.	Total	Res.	Com.	Indust.
Albany	City	Albany	787,013	163,747	525,549	97,717	69,719,817	19,441,640	25,053,627	25,224,550
Colonie	Town	Albany	640,730	211,051	429,679	0	36,329,295	18,903,368	15,657,504	1,768,423
Bethlehem	Town	Albany	441,651	106,494	78,626	256,531	17,432,493	8,129,000	2,473,122	6,830,371
Guilderland	Town	Albany	247,534	106,430	141,104	0	10,744,736	7,569,255	3,134,014	38,467
Watervliet	City	Albany	69,686	18,611	12,225	38,850	4,629,623	2,043,683	736,932	1,849,008
Menands	Village	Albany	66,902	11,657	42,887	12,359	3,631,556	1,088,386	2,394,300	148,870
Colonie	Village	Albany	65,173	24,273	40,899	0	3,313,277	2,079,231	1,234,046	0
Cohoes	City	Albany	58,060	34,339	23,721	0	8,812,594	3,513,436	1,043,180	4,255,978
Green Island	Village	Albany	45,366	10,699	18,978	15,689	2,442,244	483,298	473,173	1,485,773
New Scotland	Town	Albany	38,286	23,765	14,521	0	595,948	413,659	182,289	0
Coeymans	Town	Albany	26,764	15,489	5,196	6,080	265,737	18,145	133,256	114,336
Ravena	Village	Albany	18,598	10,986	7,575	37	617,017	395,068	221,949	0
Westerlo	Town	Albany	16,842	12,466	2,091	2,286	0	0	0	0
Berne	Town	Albany	12,645	10,737	1,908	0	0	0	0	0
Voorheesville	Village	Albany	11,022	8,097	2,925	0	970,673	739,091	231,582	0
Knox	Town	Albany	10,138	9,333	805	0	5,414	5,414	0	0
Rensselaerville	Town	Albany	9,860	8,168	1,505	187	0	0	0	0
Altamont	Village	Albany	7,107	5,268	1,839	0	465,355	392,611	72,744	0
Green Island	Town	Albany	0	0	0	0	0	0	0	0

Table B 3. Vehicle-miles-traveled and Fuel Consumption (gallons) by Municipality

Community Name	Type	County	Vehicle Miles Traveled and Fuel Consumption (gallons)			
			VMT	Gasoline	Ethanol	Diesel
Menands	Village	Albany	131,076,906	5,105,949	567,328	672,121
Colonie	Village	Albany	142,982,262	5,559,689	617,743	658,896
Voorheesville	Village	Albany	20,464,079	794,177	88,242	84,410
Bethlehem	Town	Albany	359,198,482	13,952,741	1,550,305	1,638,551
Colonie	Town	Albany	1,372,496,943	53,340,359	5,926,707	6,435,232
Altamont	Village	Albany	6,605,201	256,775	28,531	35,328
Cohoes	City	Albany	60,520,335	2,345,765	260,641	247,388
Guilderland	Town	Albany	472,166,930	18,346,988	2,038,554	2,088,286
Watervliet	City	Albany	111,067,234	4,324,953	480,550	563,806
Albany	City	Albany	1,041,725,983	40,542,803	4,504,756	5,132,858
Green Island	Village	Albany	17,866,323	695,426	77,270	85,947
Ravena	Village	Albany	25,278,922	983,622	109,291	138,578
New Scotland	Town	Albany	122,784,111	4,767,469	529,719	572,753
Coeymans	Town	Albany	141,222,286	5,468,897	607,655	974,333
Knox	Town	Albany	26,123,677	1,015,549	112,839	139,722
Rensselaerville	Town	Albany	25,469,880	990,067	110,007	143,517
Berne	Town	Albany	32,213,436	1,252,181	139,131	171,339
Westerlo	Town	Albany	40,583,926	1,577,686	175,298	217,062
Green Island	Town	Albany	17,866,323	695,426	77,270	85,947

Table B 4. Household GHG emissions and Energy Cost of Living

Community	Type	County	Per-Household GHG Footprint (MTCDE)			Energy Cost of Living (ECOL)		
			Energy	Transport	HH Total	ECOL (\$)	income	% income
Coeymans	Town	Albany	8.0	8.0	15.9	6,560	68,730	10%
Albany	City	Albany	4.3	3.9	8.2	4,154	53,425	8%
Ravena	Village	Albany	6.6	6.6	13.2	6,069	62,653	10%
Colonie	Town	Albany	6.9	6.3	13.1	5,243	86,844	6%
Bethlehem	Town	Albany	7.2	6.7	13.8	5,717	101,025	6%
Guilderland	Town	Albany	6.4	5.9	12.3	5,422	92,769	6%
New Scotland	Town	Albany	9.9	9.2	19.1	6,851	101,545	7%
Cohoes	City	Albany	4.0	3.6	7.6	4,268	51,075	8%
Colonie	Village	Albany	6.8	6.3	13.0	5,290	88,704	6%
Watervliet	City	Albany	3.7	3.4	7.1	4,085	47,905	9%
Menands	Village	Albany	5.6	5.1	10.7	4,780	94,569	5%
Westerlo	Town	Albany	8.1	8.0	16.1	7,571	71,046	11%
Green Island	Village	Albany	5.0	4.5	9.5	5,187	57,344	9%
Green Island	Town	Albany		0.0	0.0	5,187	57,344	9%
Berne	Town	Albany	6.9	6.9	13.8	7,756	69,778	11%
Knox	Town	Albany	8.5	8.4	16.8	7,805	82,246	9%
Rensselaerville	Town	Albany	8.4	8.3	16.7	8,355	67,899	12%
Voorheesville	Village	Albany	6.9	6.4	13.2	5,607	86,868	6%
Altamont	Village	Albany	7.6	7.1	14.7	6,187	80,634	8%

Community Goals

The inventory provides an assessment and roadmap to drive decision making related to sustainability in Albany County. Because it is the most populous County, Albany County has the highest emissions in the region, providing opportunities for leadership in emissions reduction. Fuels and energy used in homes, businesses, and industry are combined the largest source of GHG emissions in the County. To target this area the County can work with the business community and particularly heavy industry to identify innovative ways to reduce the fuel intensity of their manufacturing processes. Another approach to reduce emissions in this category could be identifying programs and resources to improve the efficiency and transition the fuels use in the relatively old building stock found in the urban areas of the County. Finally, transportation is a significant emissions source in Albany County which can be reduced both by transitioning the County fleet to zero emissions vehicles and creating a network for charging/fueling stations throughout the County to encourage the transition to these vehicles.

Methodology and Data Sources

Residential, Commercial, and Industrial Energy Consumption

Fuels and energy used in homes, businesses, and industry are combined the largest source of GHG emissions in the Capital District. They include:

- Scope 1 direct emissions from burning natural gas, coal, fuel oils (#1, #2, #4, #5, #6), kerosene, propane, used oils, petroleum coke, motor gasoline, other petroleum products.
- Scope 2 emissions attributed to electricity consumption.
- Biogenic CO₂ emissions from wood and bio-methane combustion.

Natural gas and electricity: National Grid, Central Hudson, New York State Electric and Gas (NYSEG), and the Green Island Power Authority (GIPA) provided aggregate electricity and natural gas consumption by sector for all 160 municipalities in the Capital District. It was provided in aggregate and includes no private data for any specific utility customers.

Residential non-utility fuels (coal, fuel oils/kerosene, wood, and propane): Consumption by each municipality was estimated by allocating a portion of total US Energy Information Administration (EIA) reported statewide consumption of each fuel weighted to American Community Survey (ACS) demographic information on household counts, home-heating fuel preference, and housing unit size. The method also incorporates weighting for heating-degree-day (HDD) differences across New York.

- The ACS data is available online via the Census Bureau's American Fact Finder. The study used ACS five-year moving average demographics for home heating and housing counts, and 2010 census data for population.
- Statewide consumption of residential fuels reported by the US Energy Information Administration (EIA) and is available online at the State Energy Data System (SEDS) at <http://www.eia.gov/state/seds/>. For residential fuels, the study used five year moving average (2006-2010) consumption rates to match the timescale of the ACS data.

Commercial fuels (coal, fuel oils/kerosene, wood, and propane): Consumption by each municipality was estimated by allocating a portion of total statewide consumption to each municipality weighted to local employment totals, commercial floor square footage, home-heating fuel preference, and heating-degree-day (HDD) differences across New York. Home heating fuel choice in a community is used as a proxy to determine which fuels are most likely to be used by businesses in the same community.

Industrial fuels (coal, petroleum coke, fuel oils/residual fuel oil/kerosene, natural gas, and others): Large industry and power generators in the Capital District report fuel use and emissions directly to one or more of the following three mandatory programs from which data is made public:

- EPA's Facility Level GHG Reporting Program (GHGRP) available using EPA's FLIGHT Tool at <http://ghgdata.epa.gov/ghgp/main.do>. (US EPA, 2012)
- NYSDEC's Title 5 permits issued under the Air Permitting and Registration Program with data available at <http://www.dec.ny.gov/chemical/32249.html>
- Energy Information Administration (EIA)'s Schedule 923 Annual electric utility reporting program with data available at <http://www.eia.gov/electricity/data/eia923/>

Electricity and fuel consumption data was collected or estimated in units of MMBTU (Million British Thermal Units) and converted into GHG emissions using methods recommended by GHG Working Group (NYSERDA, 2013).

All relevant sources were pulled from these databases for 2010 and placed directly in the inventories of the communities in which they are located. Where the same facility was listed in multiple reporting sources, NYSDEC data was preferred as it is most quality controlled.

Because smaller industry does not report to the above mandatory reporting programs, the GHG Working Group created a “pie slice” method to estimate the emission contribution of unaccounted-for-industry. The method compares total statewide emissions from actual reporting facilities to industry-wide sector totals derived using EIA/SEDS energy data. The difference between the two at the state level was assumed to be a “pie slice” representing smaller unaccounted for industry, and that portion was then allocated from the state level to counties based manufacturing employment data from the New York State Department of Labor (NYS DOL). County totals were then further allocated to communities using the community-to-county ratio of industrial electricity consumption reported by the utilities.

Fuel Consumption

Fuel consumption data were taken from either from the EPA GHG Reporting Program (GHGRP), NYSDEC’s Title 5 Air Permitting and Registration Program, or from the US Energy Information Administration’s (EIA) Schedule 923 reporting program that collects data annually from that nation’s power producers. Where facilities were represented in more than one reporting program, NYSDEC data was preferred because it is quality controlled by the Agency. Scope 1 emissions are reported in the Detailed GHG Inventory Reports for the region and counties in Appendix A, but as per reporting convention they are not counted in the “roll up” emission inventories.

Transportation

Transportation sector GHG accounting methods and data sources are summarized as follows:

On-road: The Capital District Transportation Committee (CDTC) provided detailed vehicle-miles-traveled (VMT) data for Albany, Rensselaer, Schenectady, and Saratoga Counties at a municipal level. The New York Department of Transportation (NYSDOT) provided county-level data for Columbia, Greene, Warren, and Washington Counties which was then allocated to communities by the ratio of municipal to county road length as reported in the NYSDOT state inventory of highways. Community VMT was converted into fuel consumption and GHG emissions following the recommended methods created by the GHG Working Group (NYS GHG, 2013). Municipal level VMT data and estimated fuel consumption for all 160 Capital District municipalities is available in Appendix B, Table B 3.

Off-road: NYSDEC provided detailed county-level GHG emissions for 214 types of off-road equipment for the year 2007. NYSDEC prepares the data every three years to support air quality modeling and was in the process of updating the data at the time of this study. The GHG Working Group decided that the 2007 data, in absence of updated data, can be presumed valid for 2010. The county data was further allocated to individual municipalities based on population.

Rail: Rail is categorized into four main groups: Class I freight, Class II/III freight, passenger/commuter, and switchyard rail. Within the Capital District all eight counties contain Class I railways, while only two counties (Rensselaer and Washington) contain Class II/III freight. Passenger lines include Amtrak and Adirondack Scenic Railroad. There is no electric rail in the region. As per decisions of the GHG Working Group, diesel consumption by county was pulled directly from the 2002 *Locomotive Survey for New York State* (NYSERDA, 2007) and that data was used as a proxy for year 2010. The GHG Working Group looked at updating this source but found it impractical to do so. The NYSERDA county level data was allocated to communities by relative length of rail track passing through each community.

Air: Unlike the other transportation sectors that count Scope 1 (direct) emissions, this mode follows a Scope 3 method that attributes emissions to flight miles arriving and departing from regional airports. The GHG Working Group created an emissions factor of 0.02381497 MTCDE/flight-mile (NYSGHG 2012.) In 2010, Albany Airport (ALB), Glens Falls Airport (GLF), Schenectady County Airport (SCH), and Saratoga Springs (VWK) reported to the Federal Aviation Administration (FAA) a total of 22,364,620 arrival and departure flight miles, translating into a regional footprint of 532,613 MTCDE. Regional emissions were then allocated to counties based on population and reported in Table 12. Scope 3 air emissions were not allocated to communities and are not included in the roll up GHG inventory transportation sector totals in Appendix B, Table B 1.

Marine: Marine emissions come from private and commercial vessels. County-level emissions from private craft were included in the non-road data set provided to the GHG Working Group by NYSDEC. Those emissions were allocated to communities based on the ratio of municipal to county surface water area as reported in the 2010 census. Commercial emissions were not included in the NYSDEC non-road dataset, and so county-level CO (carbon monoxide) emissions from commercial marine vessels were taken from the 2008 US National Emissions Inventory 1 and converted into CO₂ on a mass basis using a ratio of 1:150. This ratio was derived from the CO and CO₂ emission factors for non-ocean going vessels contained in the Intergovernmental Panel on Climate Change (IPCC) 1996 Guidelines for GHG inventories (IPCC, 1996).

Waste

The GHG Working Group developed Scope 1 and Scope 3 methods to estimate this source. The group concluded that both should be listed on the Detailed GHG Inventory Reports in Appendix A, but that only Scope 3 will be included in “roll up” GHG inventories. The methods are summarized as follows:

Scope 1 (direct) emissions come from landfills within a community boundary and in the Capital District there are only two sources, the City of Albany’s Rapp Rd. landfill and the Town of Colonie’s landfill. Closed landfills can also create emissions but they were excluded because they all have been closed for more than 20 years and emissions should be low. The Wheelabrator Hudson Falls LLC WTE plant in Hudson Falls in Washington County is counted in the power generation sector and not in the waste sector. All three facilities report to US EPA’s GHGRP and to NYS DEC’s Title 5 air permitting rule and so emissions data were pulled directly from these sources for 2010.

Scope 3 (attributed) emissions are based on how much solid waste communities send to landfills and WTE plants each year. Therefore all communities have Scope 3 emissions. For Scope 3 the GHG Working Group decided to adopt a “forward commitment” method that links emissions directly to base-year waste generation- regardless of whether the waste is incinerated

immediately or is deposited in a landfill where it's actual emissions will be created slowly over the next 100 years. Although WTE plants were not counted in the Scope 1 waste footprint they are included in the Scope 3 waste footprint calculation.

The GHG Working Group compiled data from annual reports submitted to NYSDEC by landfill and WTE plant operators. These reports show much MSW each facility receives by county of origin. The GHG Working Group collated data from all reports statewide and developed a waste flow matrix showing how much waste originated from each county, where it went, and how much went to landfills vs. WTE plants.

Scope 3 waste GHG emissions were computed from the waste tonnages sent by counties to landfills and WTE plants. For the land-filled portion, emissions were calculated using the "First Order Decay" (FOD) model developed by the California Air Resources Board and recommended by ICLEI Local Governments for Sustainability as part of the Local Government Operations Protocol (ICLEI, 2011). The model was set up using waste stream composition data for New York (NYSDEC, 2012) and then forward integrated 100 years presuming an average landfill methane capture rate of 75%.

Agriculture

For Agriculture, the GHG Working Group recommended using the US EPA State Inventory Tool to estimate emissions (US EPA, 2012). Emissions are driven primarily by livestock population and crop acreage, and so the SIT was modified and applied to each Capital District county with data from the National Agricultural Statistics Service (NASS.) NASS provides data on the number of farms, amount of crop area, and livestock counts for each New York County. County emissions were allocated to towns by the ratio of town land area to total town land area in the county. No emissions were assigned to cities and villages.

For Albany County's Agriculture Emissions, the total is 26,544 MTCDE - 11,174 MTCDE Enteric Fermentation, 2,363 MTCDE Manure Management, and 13,008 MTCDE Use of Fertilizer/ Ag Soils.

Enteric fermentation: methane (CH₄) emissions from livestock as a byproduct of digestion.

Manure management: methane (CH₄) emissions from processing livestock manure, as well as fugitive emissions from field manure. This methane can be harnessed to generate power and reduce GHG emissions using technologies to capture methane.

Soils and Field Management: fugitive N₂O emissions from nitrogen-based fertilizer, as well as small amounts of CH₄ from burning crop residues.

In general:

- Natural gas and electricity consumption is provided by National Grid, Central Hudson, New York State Electric and Gas (NYSEG), and the Green Island Power Authority (GIPA) at a community level. It is the best data available and cannot be improved.
- Non-utility fuel consumption (e.g., fuel oils, propane, and wood, etc.) is estimated with demographic methods created by the GHG Working Group that are the kind most often used

by communities when they develop inventories on their own. They usually cannot be improved unless communities have specific local fuel survey or sales data from fuel suppliers.

- Large industry and power plant emissions come directly from state and federal reporting sources and are placed directly in the community inventory. The estimates cannot be improved although correct placement should be checked.
- Detailed community level transportation (VMT) data was provided by the Capital District Transportation Committee (CDTC) for Albany, Rensselaer, Saratoga, and Schenectady counties, and is the best available data. For Columbia, Greene, Washington, and Warren Counties, NYS Department of Transportation (NYSDOT) county data was allocated to communities by road length as discussed in the transportation sector. Communities in Warren and Washington counties may be able to obtain better local VTM estimates by contacting the Glens Falls / Adirondack Transportation Council, the MPO serving those two counties.
- Scope 1 estimates from landfills are reported directly by the landfills to the US EPA's mandatory GHG reporting program (GHGRP). They cannot be improved. Municipal solid waste (MSW) generation in tons for the Scope 3 calculation is estimated by allocating county data to communities based on population. Communities that haul waste can improve the calculation with actual hauled waste totals.
- Wastewater emissions are estimated with the EPA's State Inventory Tool which combines per-capita emission averages with community population. Communities can improve the estimates by applying process-specific methods to waste water treatment plants in the community following the Local Government Operations Protocol (ICLEI, 2011).
- Agricultural emissions are first created at a county level with EPA's State Inventory Tool and then allocated to towns based on land area. Agricultural methods are driven with county data from the National Agricultural Statistics Service (NASS) on crop acreage and livestock population. Local estimates could be improved if actual community-level livestock populations and crop acreage is available.

CDRPC will be able to assist Climate Smart Communities in making use of this product. For those planning to update or create a new GHG inventory for years beyond 2010, they should check with CDRPC on the status of updated utility and transportation data that may be available to them.

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