

Baseline Community GHG Inventory

Community Climate Steering
Committee

August 6, 2014

Topics to Cover

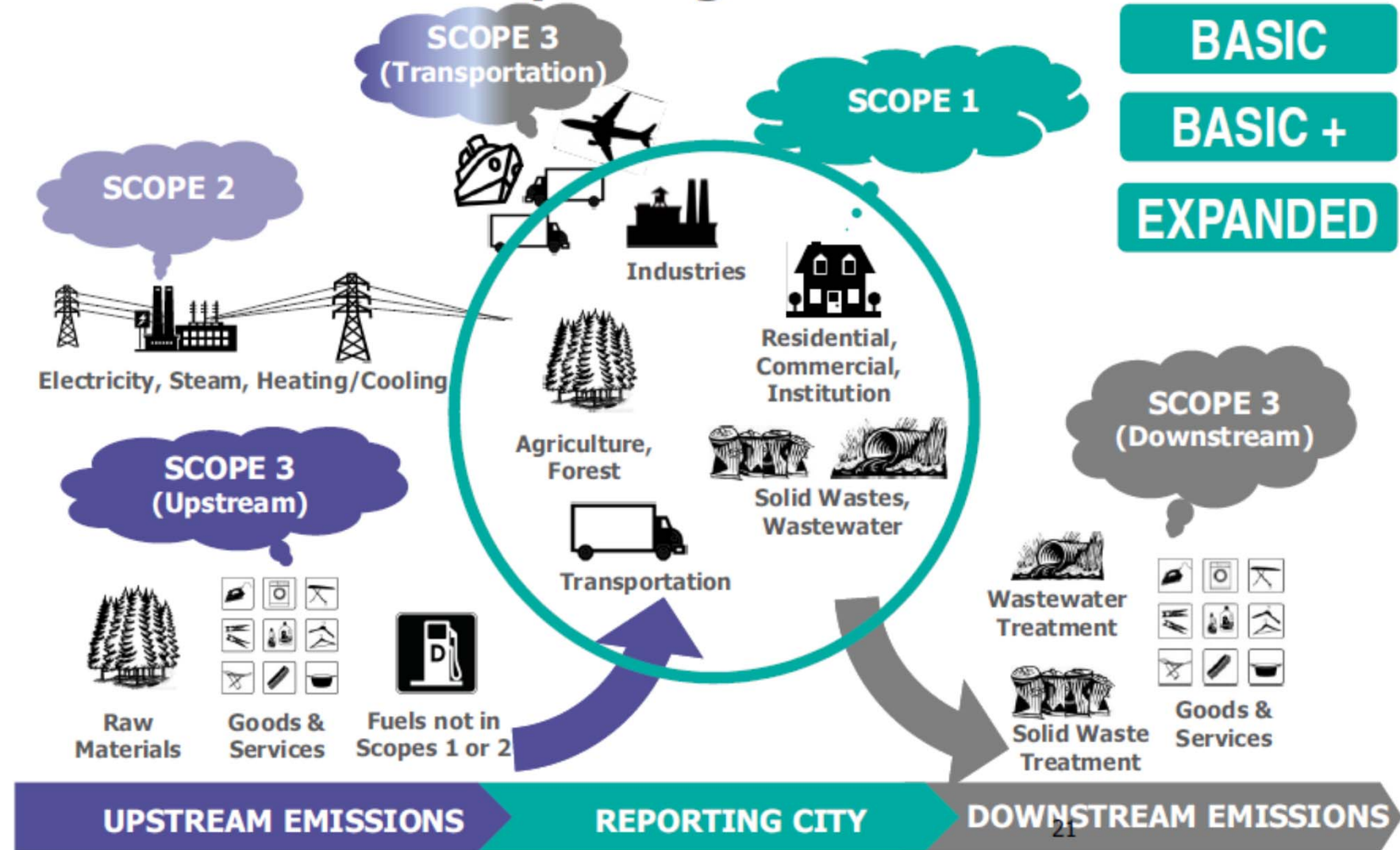
- Community GHG Inventory:
 - Overview
 - Sector Inventories (data, boundaries, calculations)
 - Transportation
 - Electricity and Natural Gas
 - Industrial Fugitives
 - Materials Management (waste)

Protocol

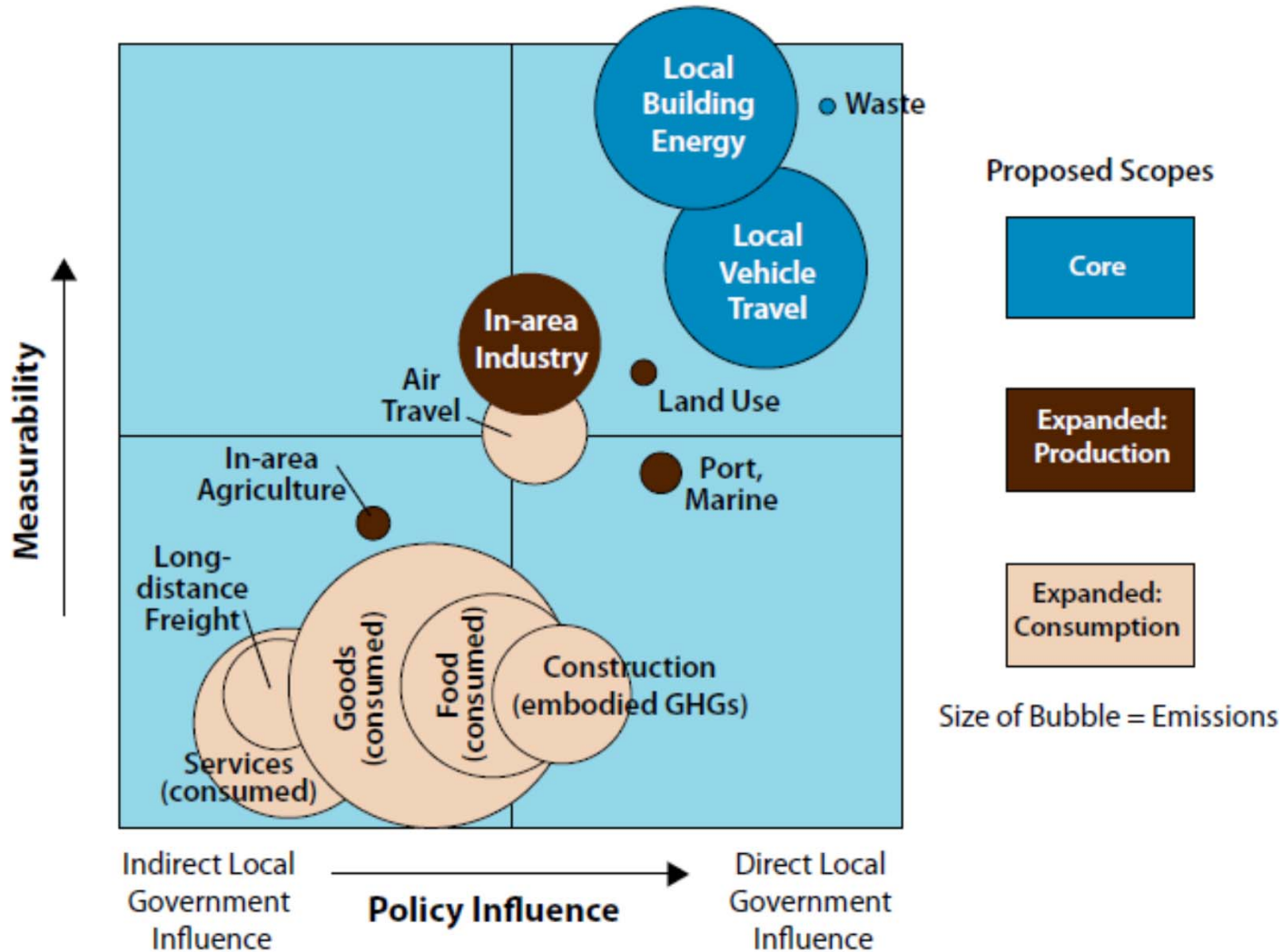
- Developed by ICLEI (Local Governments for Sustainability)
- ICLEI is the world's leading association of cities and local governments dedicated to sustainable development
- Protocol Released October 2012
- Designed to guide *U.S. local governments* to account for and report on community wide greenhouse gas emissions
- One other option – World Resources Institute international accounting tool



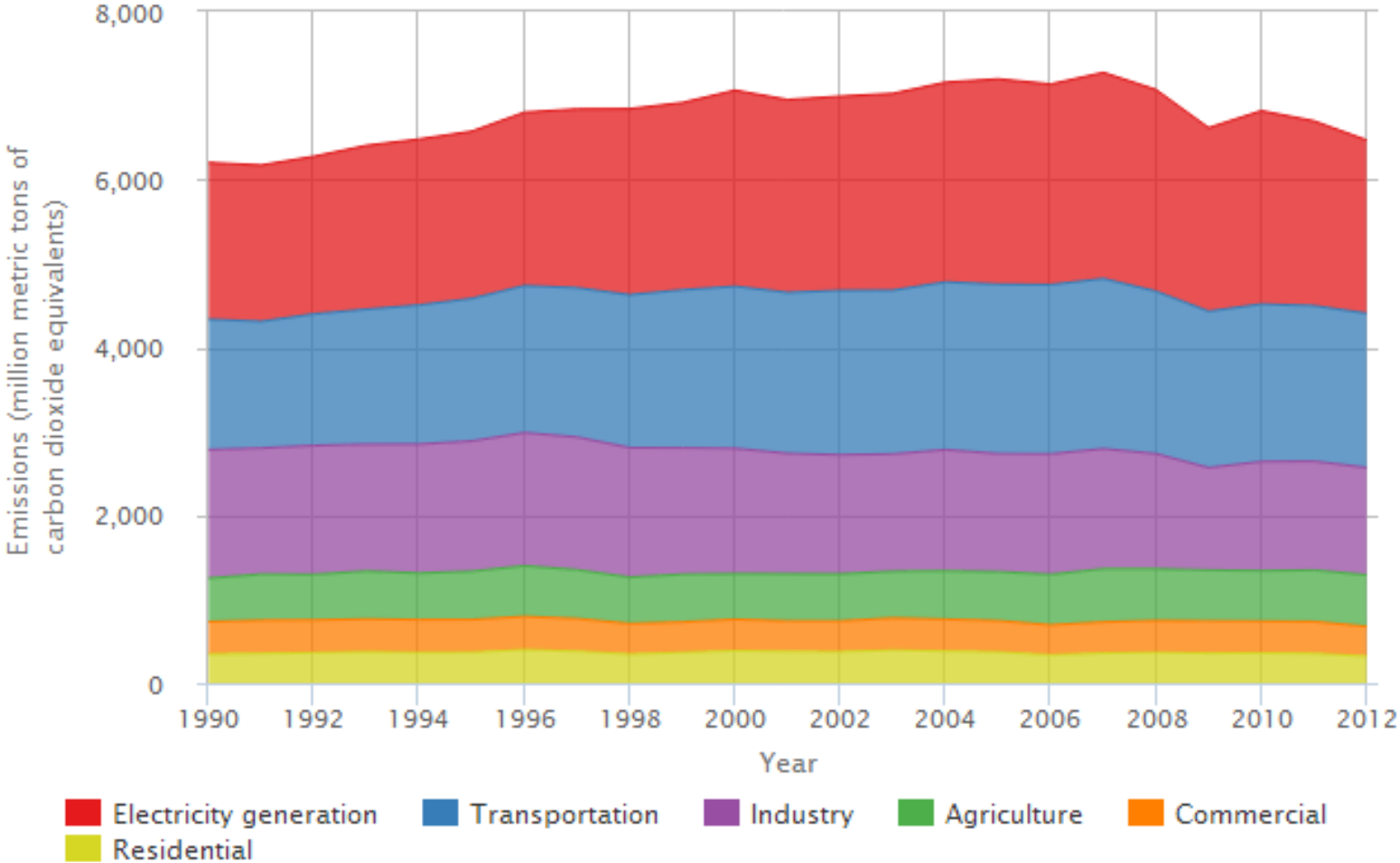
Illustration of Reporting Framework



GHG measurability vs influence

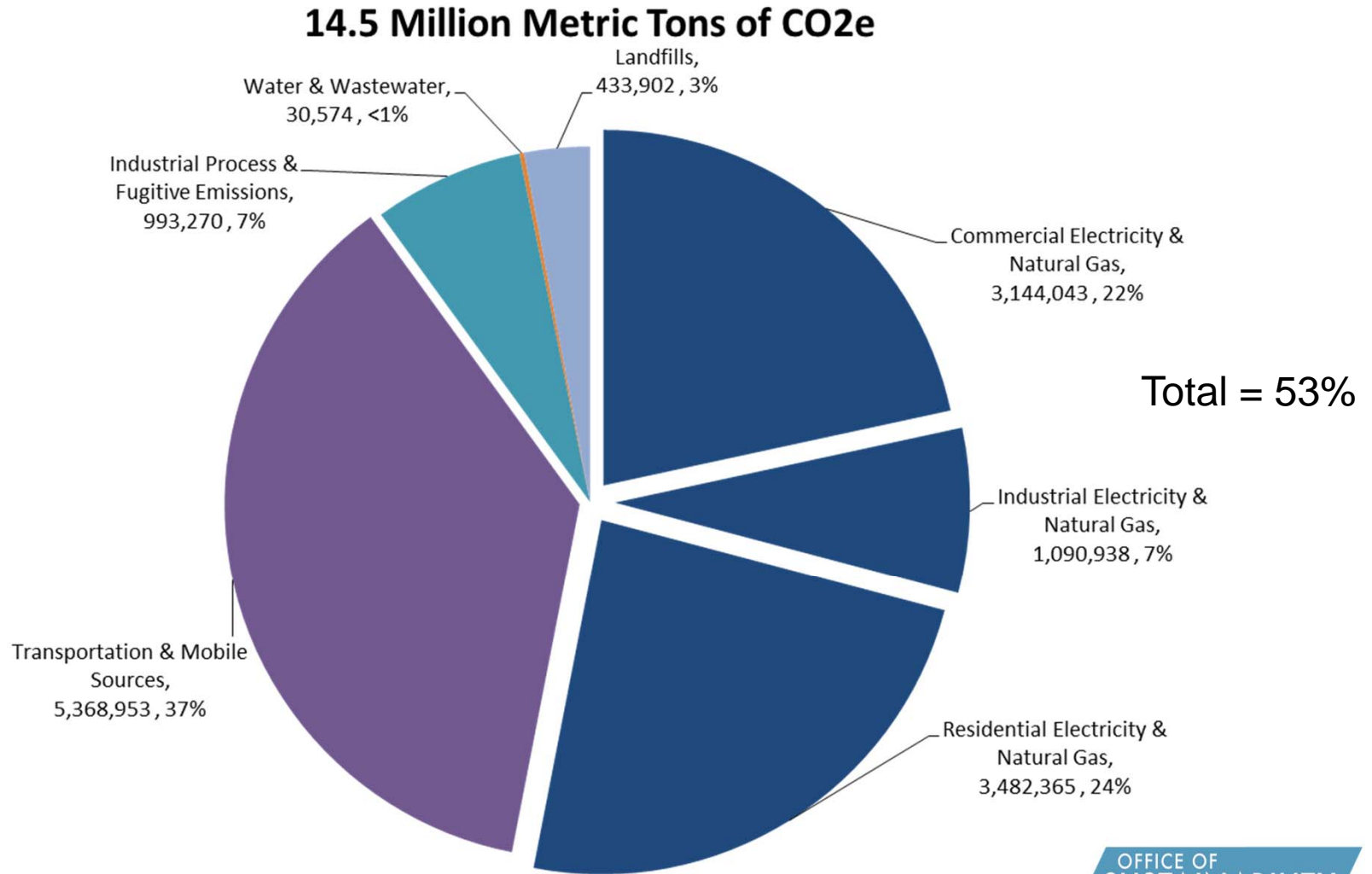


U.S. Greenhouse Gas Emissions by Economic Sector, 1990-2012



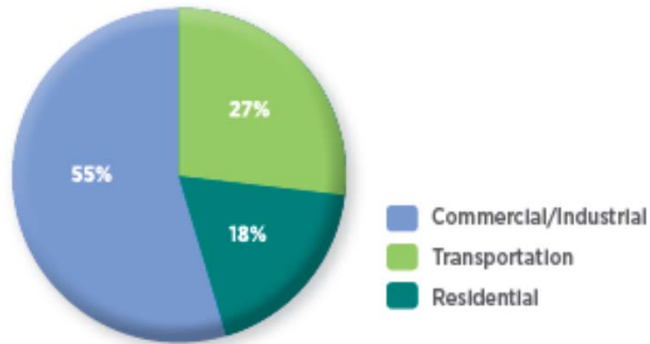
Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012.
<http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>

2010 Estimated Travis County GHG Inventory

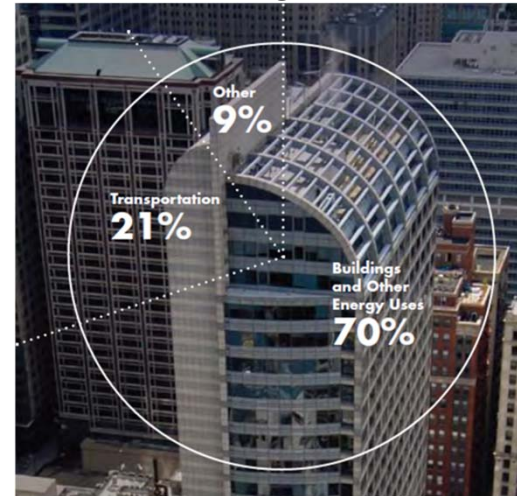


Other Cities

Boston 2008 GHG Emissions by Sector



Chicago 2000



Denver 2005

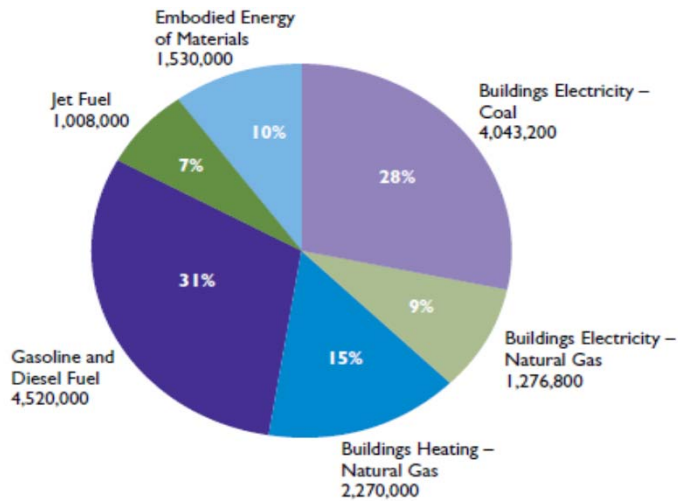
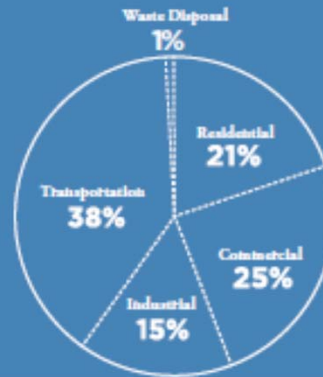
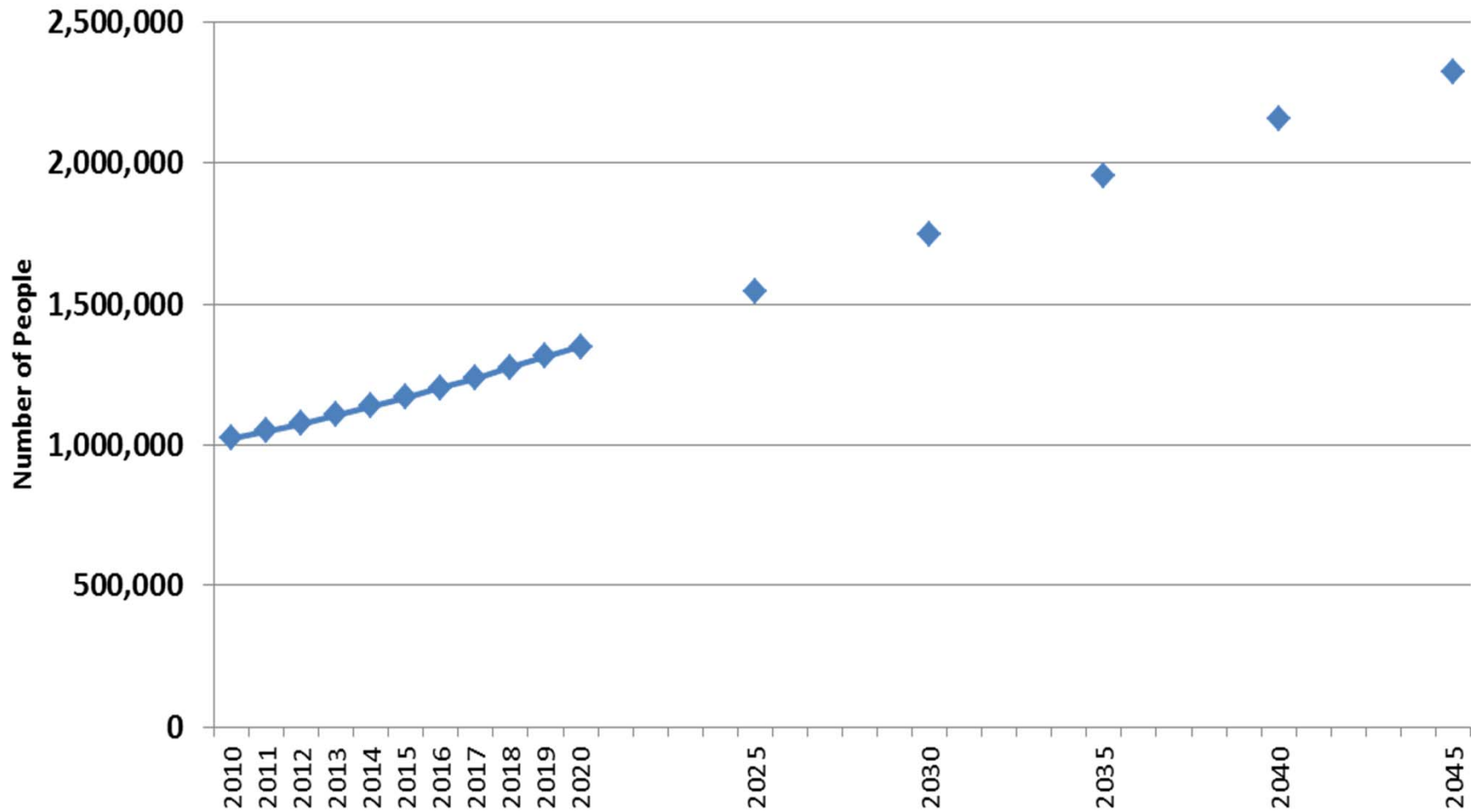


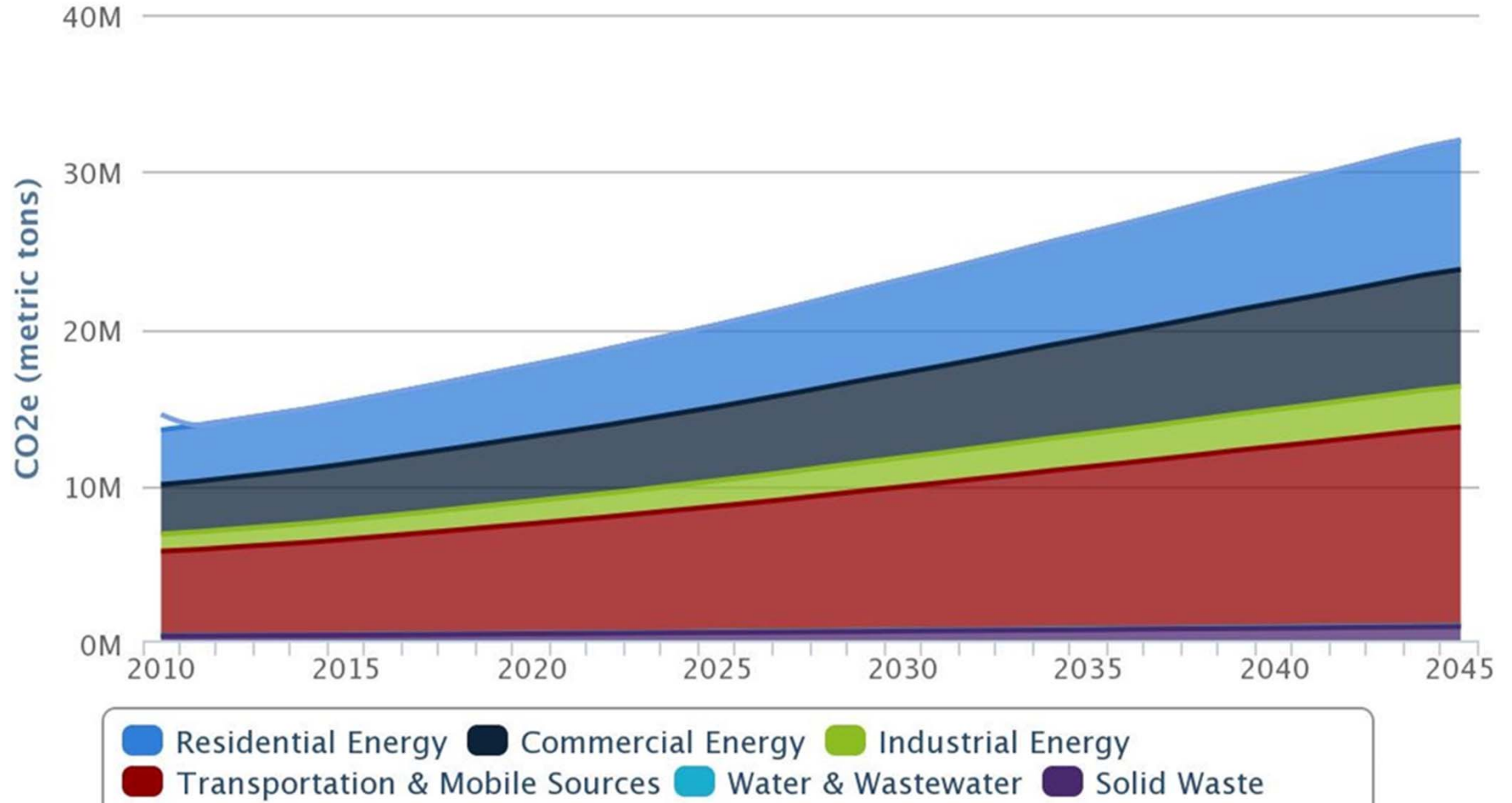
FIGURE 2
2008 MULTNOMAH COUNTY
GREENHOUSE GAS EMISSIONS BY SECTOR



Population Projections for Travis County



Emissions and Business as Usual Growth



Transportation

GHG Source	GHG Types	Data Required	Available Methodologies
Passenger vehicle operation	CO ₂ , CH ₄ , and N ₂ O	Output of a regional travel demand model	TR.1.A
		OR -Vehicle distance traveled within the jurisdiction	TR.1.B
Freight and service truck operation	CO ₂ , CH ₄ , and N ₂ O	- State or county level truck VMT data from FHWA HPMS or other source - Jobs in truck-generating industries for municipality, county, and/or state	TR.2.A
		OR - Travel demand model output – heavy duty VMT and speeds by network link (TR.2.B), or truck trip-ends and associated trip lengths (TR.2.C), in municipality - Speed-based CO ₂ , CH ₄ , and N ₂ O emission factors from MOVES or EMFAC model	TR.2.B TR.2.C
Freight rail operation	CO ₂ , CH ₄ and N ₂ O	- Line-haul freight movement (annual ton-miles moved by rail line, for all rail lines traversing the community) - Switching yard activity (number of locomotives and annual hours of operation per locomotive) - Line-haul and switching locomotive emission factors	TR.3
Transit operation fuel combustion	CO ₂	- Actual fuel use or -Fuel use estimated from vehicle miles traveled and vehicle fuel economy	TR.4.A
Transit operation fuel combustion	CH ₄ and N ₂ O	- Vehicle miles traveled by vehicle type or - Fuel use by vehicle type	TR.4.B
Transit traction power	CO ₂ , CH ₄ and N ₂ O	- Electricity use by mode	TR.4.C
Attribution of Transit emissions		- Geographic data source of the transit agency's routes for each mode as well as the transit vehicle schedule (headways). - Number of ferry stops in each jurisdiction	TR.4.D, TR.4.E, TR.4.F



Not Included –
Not applicable



GHG Source	GHG Types	Data Required	Available Methodologies
Operation of inter-city passenger rail	CO ₂ , CH ₄ and N ₂ O	- Number of trains per day - Length of track within community - Energy intensity of passenger rail	TR.5
Air travel-aircraft emissions	CO ₂	Airport inventory	TR.6.A
		OR - FAA's AEDT/SAGE emissions model output for airport in a calendar year or - ACRP Report 11 Airport Inventory Method 1 or 2	TR.6.B
Air travel-ground support equipment and vehicles	CO ₂ , CH ₄ and N ₂ O	Airport inventory	TR.6.A
		OR Fuel consumption of airport fleet vehicles and ground support equipment	TR.6.C
Attribution of Air travel emissions		Airport passenger surveys that identify the number of passengers that are traveling to/from the community	TR.6.D
Marine vessels	CO ₂ , CH ₄ and N ₂ O	<ul style="list-style-type: none"> Total number of vessels operating within community's waters by type Activity hours of vessel within community's waters Maximum power (kilowatt) rating of each vessel and average load factor Power used by ships during hoteling 	TR.7.A
Other off-road equipment	CO ₂	<ul style="list-style-type: none"> Number of building permits in county and jurisdiction Number of households in county and jurisdiction 	TR.8.A
Fuel upstream lifecycle emissions		<ul style="list-style-type: none"> The same data required for TR.1 through TR.8 broken down by type of fuel Scaling Factors for Full Fuel-Cycle Emissions in Table TR.9.1 	TR.9

Not Included –
Data not available



Not Included –
Data not available

Not Included –
Not Applicable



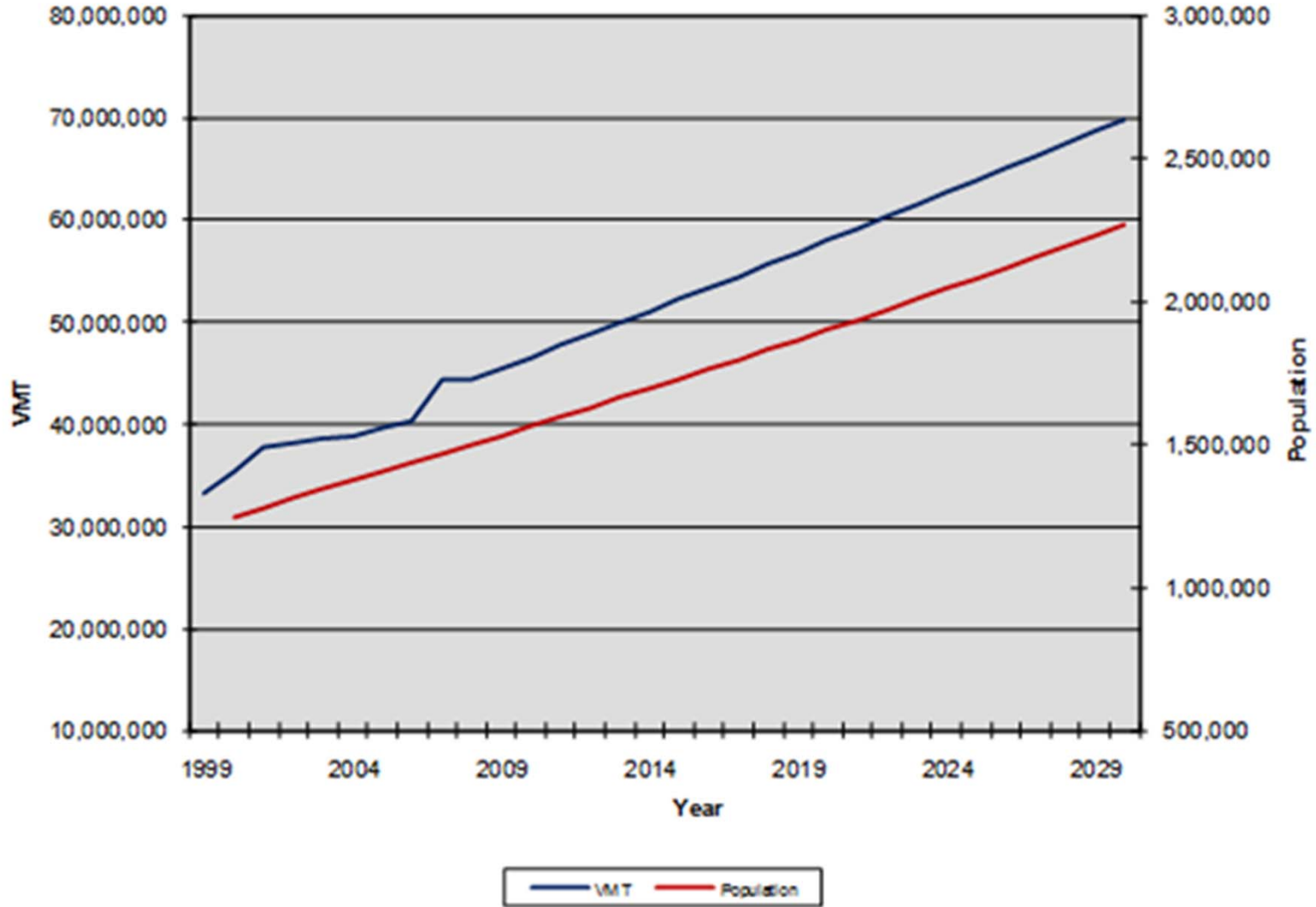
Not Included –
Data not available

Estimating Emissions from on-road Vehicles

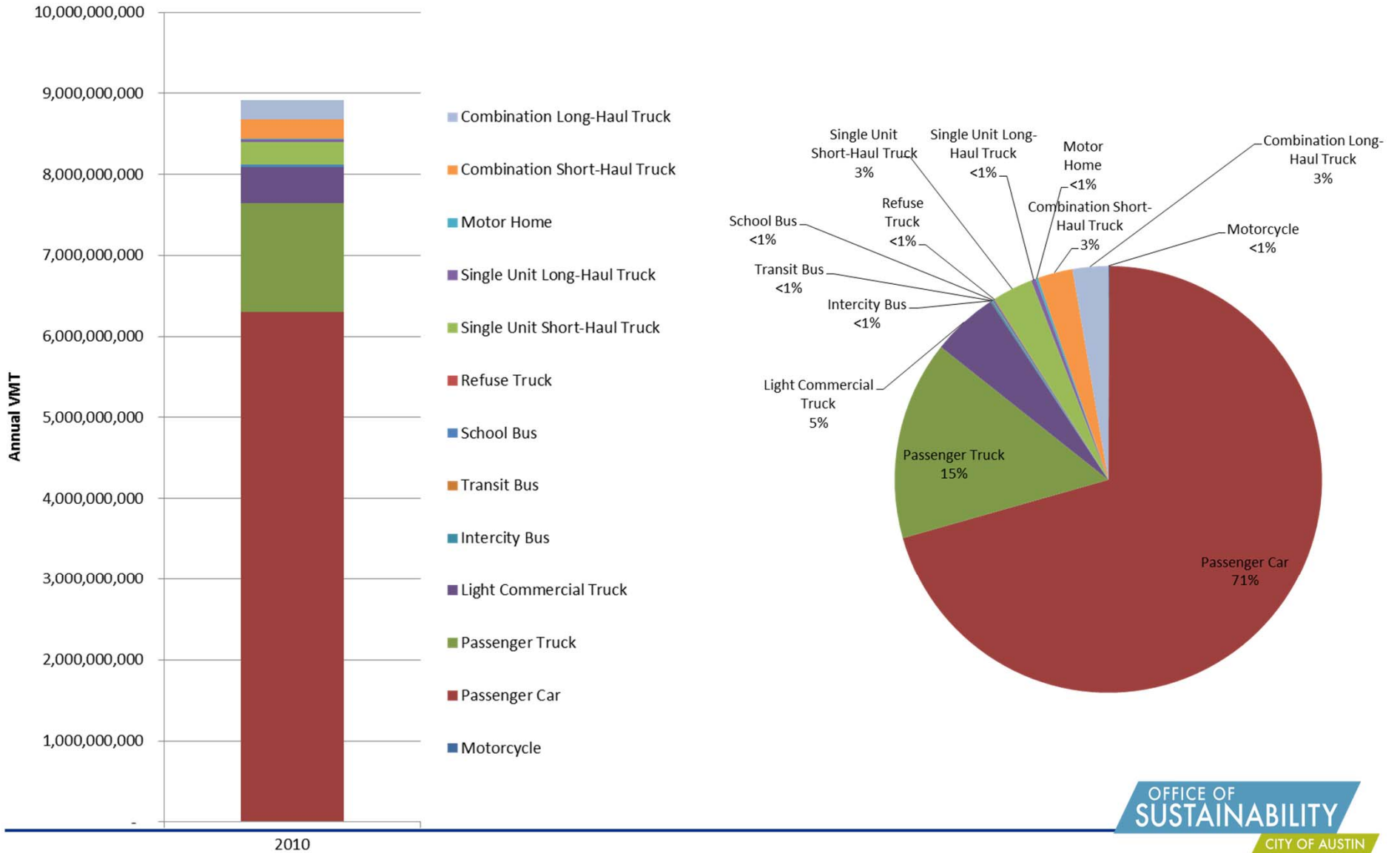
Annual Vehicle Miles Traveled (mi) x (energy/mile)
x (CO₂e/energy) = Annual CO₂e

- Annual VMT = Daily VMT x 329 days
- 2010 Data for Travis County *(provided by Texas Transportation Institute)*
 - Summertime weekday VMT totals = 27,106,899
 - Daily CO₂ = 14,219 tons
 - Daily CH₄ = .56 tons
 - Average CO₂ / mi = 0.0005
 - Average mpg = 21.88

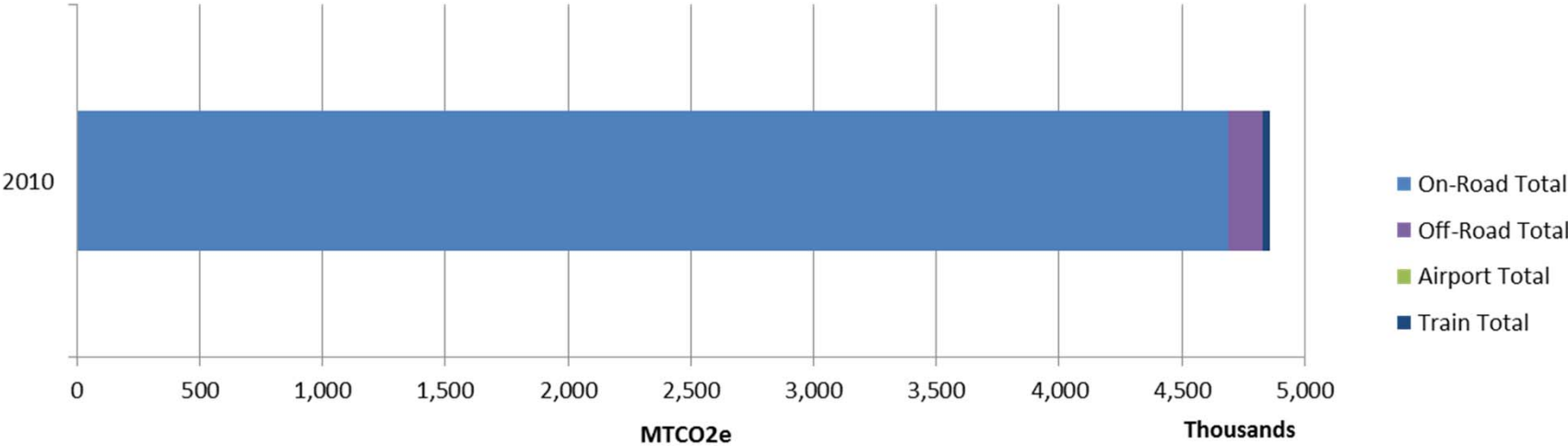
Austin Region Summer Weekday VMT and Population Trends



Vehicle Mix



Transportation & Mobile Sources



Electricity and Natural Gas

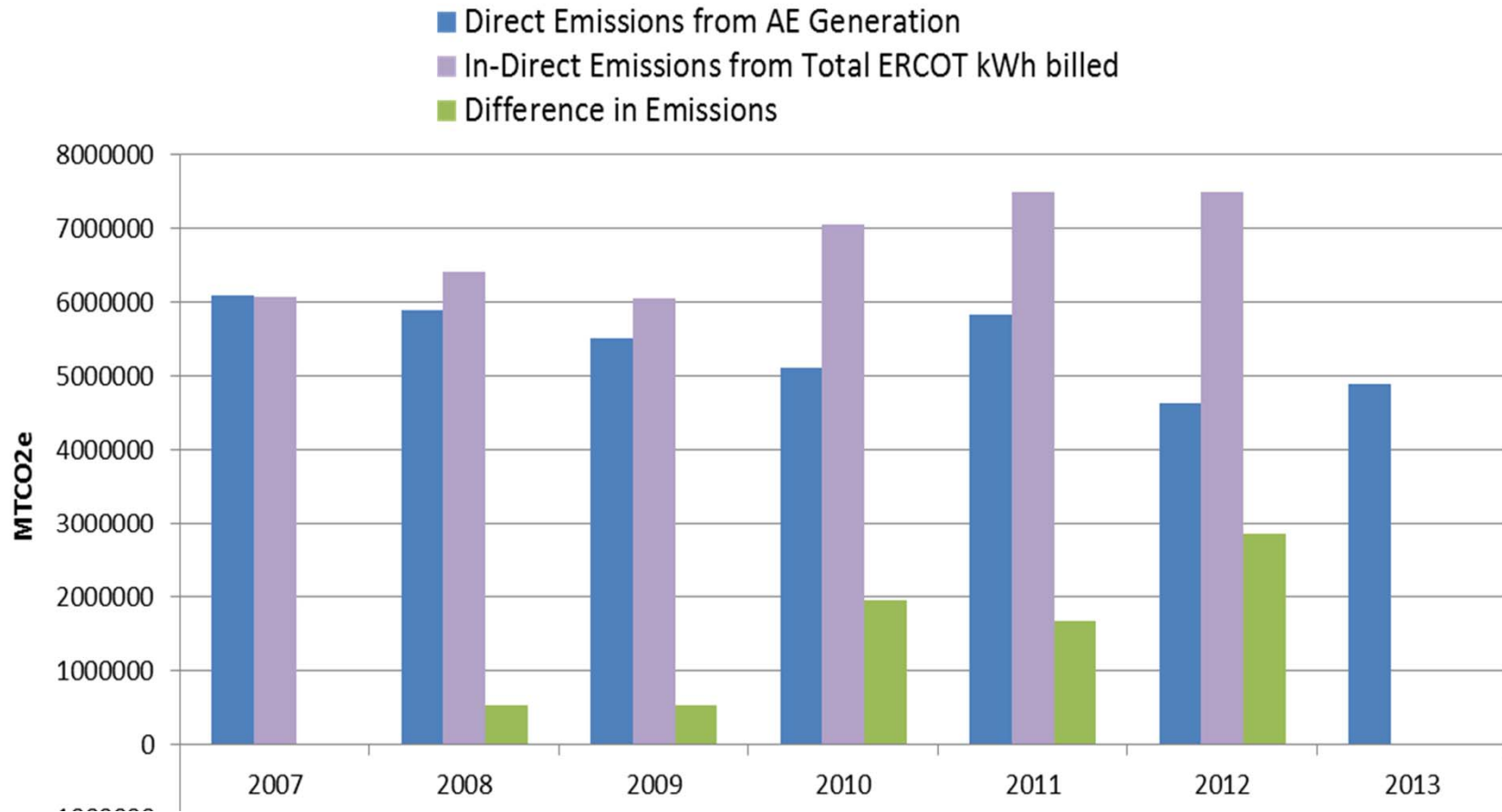
Sources & Activities

Built environment emissions are attributed to the following sources and activities:

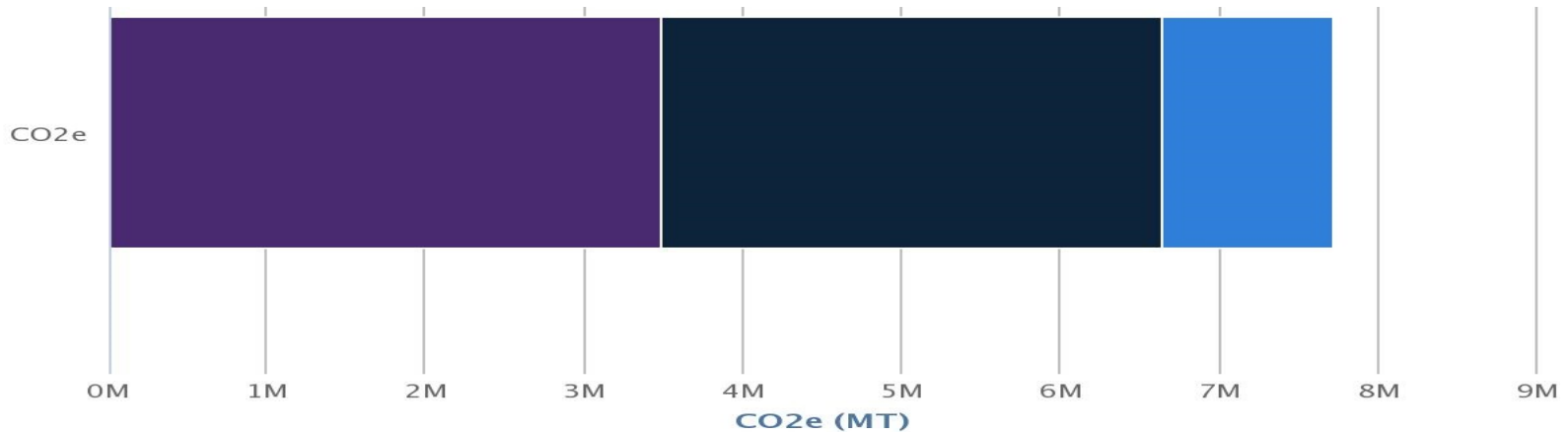
- stationary fuel combustion
- electricity use
- life-cycle (i.e. “upstream”) emissions from energy use
- refrigerant and fire suppressant leakage
- district heating and cooling energy use
- electric power transmission and distribution losses
- electric power production

Included in
Current
Inventory
**Currently Do
not Track**
Power Utility
Inventory

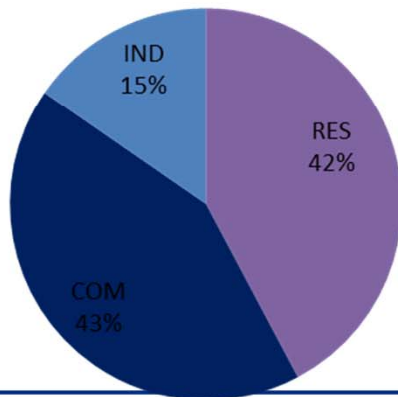
Power Plant emissions vs Community Electric Use



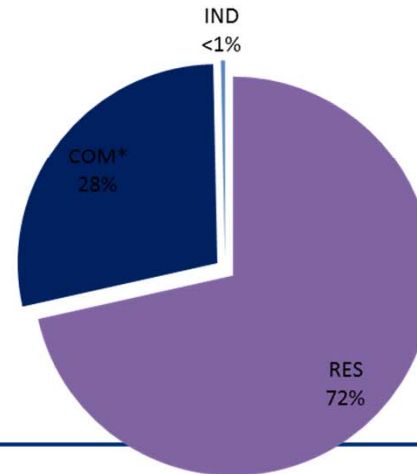
Electricity & Natural Gas Emissions



Electricity Use
14.03 Billion kWh
7.4 Million MTCO2e



Natural Gas Use
112 Million CCF
616,000 MTCO2e



Industrial Fugitives

Calculating Emissions from Industrial Processes

BE.8.1 Industrial process emissions

To include GHG emissions from industrial processes, locate facility-specific inventories performed in the same year as your overall community inventory and report those emissions as appropriate and with as much detail as is available.



Step 1: Visit the US EPA, Greenhouse Gas Emissions from Large Facilities Data Publication Tool (<http://ghgdata.epa.gov/>) and use the GHG publication tool map interface to locate facilities within your jurisdiction and open their detailed record page.



Step 2: Obtain emissions by MRR subpart category and by individual GHGs.



Step 3: Report GHGs obtained as line items by MRR Subpart and individual GHG. A list of the MRR Subpart categories is included here in Table B.21. Include the name of the facility and cite the EPA Mandatory Reporting Rule as the source of this information.

Breakdown of Industrial Emissions from EPA

- Semiconductor
 - Stationary Combustion – Natural Gas used in the destruction of process emissions
 - Process Emissions
 - Nitrous Oxide
 - Sulfur Hexafluoride, Fomblin, Krytox, NF3, Perfluorocyclobutane, Octofluorocyclopentene, PFC-14, PFC-116, HFE-7200, HFE-7500, HT-110, HT-135, HT-170, HT-200, FC-40, HFC-23, HFC-41, PFC-218, FC-3283
- Lime
 - Stationary Combustion in Kilns - Coal & Natural Gas
 - Process Emissions
 - $\text{CaCO}_3 + \text{Heat} \rightarrow \text{CaO} + \text{CO}_2$

EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT)

Industrial Process

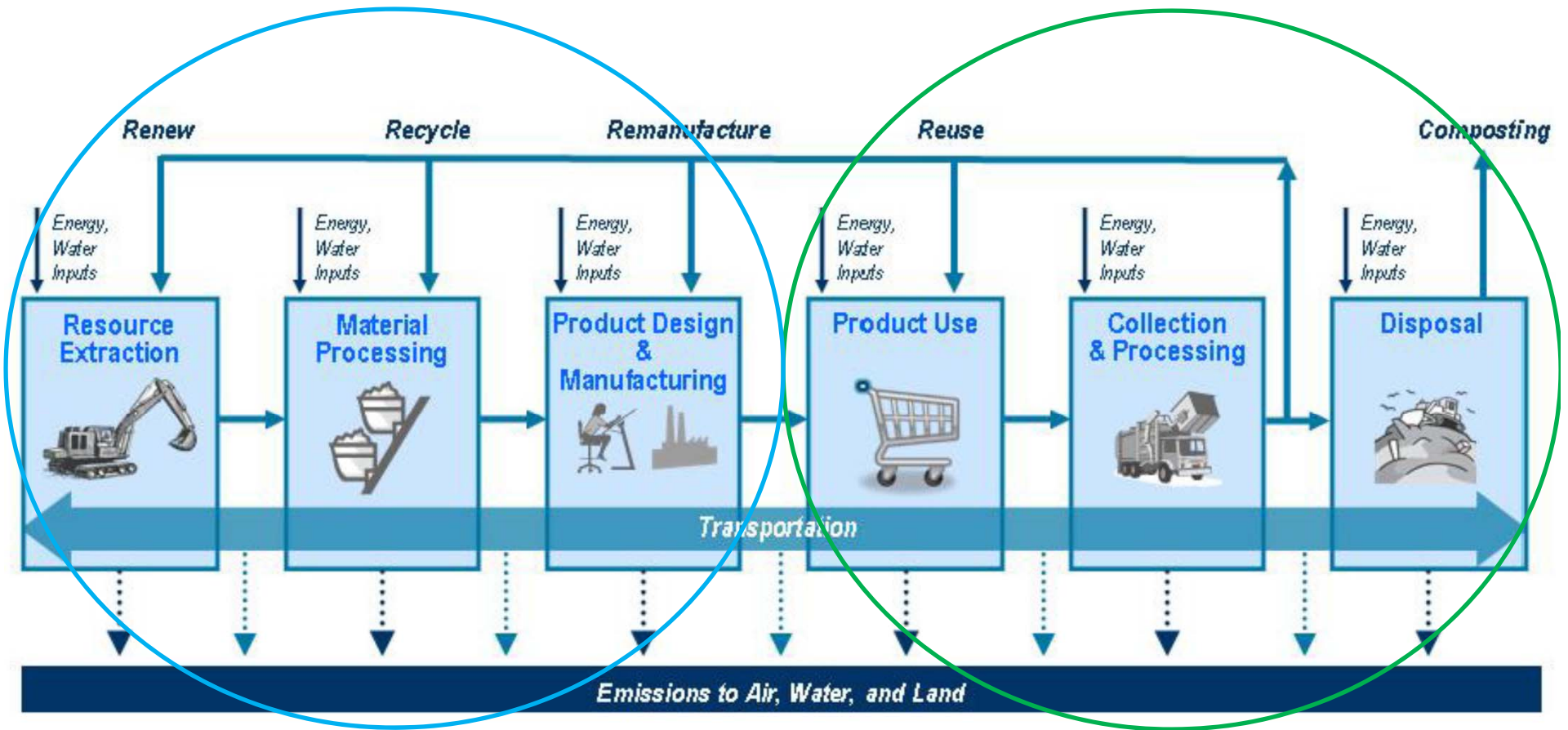
Source	2011	2012
Freescale EB site	62,897 mtCO ₂ e	58,107 mtCO ₂ e
Freescale OH site	53,809 mtCO ₂ e	59,528 mtCO ₂ e
Samsung Austin	406,859 mtCO ₂ e	322,024 mtCO ₂ e
Spancion	92,188 mtCO ₂ e	93,050 mtCO ₂ e
Austin White Lime	271,216 mtCO ₂ e	301,907 mtCO ₂ e
TOTAL	886,969 mtCO₂e	834,616 mtCO₂e

Source: EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT)

<http://ghgdata.epa.gov/ghgp/main.do>

Waste / Materials Management

Flow of materials



Geographic v. Consumption

Figure 1. King County 2008 GHG Emissions by Sector,

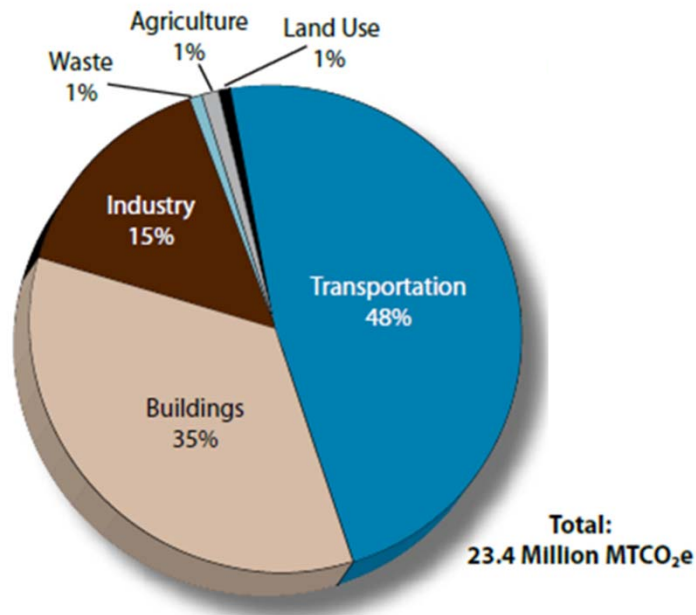
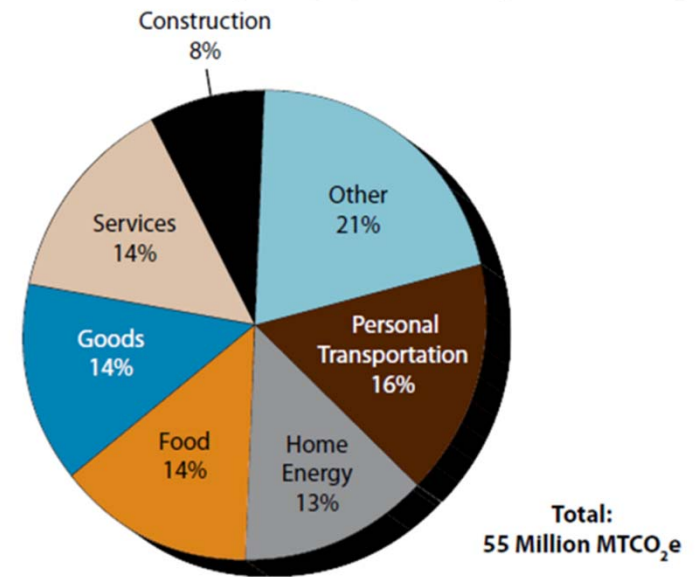



Figure 4. King County 2008 GHG Emissions by Category of Consumption, Consumpt



Emission Sources & Activities

GHG Source	GHG Type	Data Required	Available Methodologies
Landfills			
Emissions from a community's materials that are disposed of in landfills regardless of where the landfilling occurs	Fugitive CH4 emissions	- Mass of MSW sent by community to facility	SW.4 Not Included – Data not available
In-boundary landfills	Fugitive CH4 emissions	Results from the EPA's MRR* method	SW.1 
In-boundary landfills	Fugitive CH4 emissions	<ul style="list-style-type: none"> - Year landfill opened - Year landfill closed (if relevant) - Waste-in-place (wet short tons) and/or historical site-specific annual disposal tonnage - Waste characterization (defaults available) - CH4 fraction in LFG from source testing (defaults available) - Average annual rainfall in operating area (inches/year) - For partial LFG systems: Proportion of landfill surface area under the influence of gas collection system 	SW.1.1 Not Included – Data not available

*Environmental Protection Agency Mandatory Reporting Rule

Landfills and Wastewater

Source	2010	2011	2012
Texas Disposal Systems Landfill	269,661 mtCO ₂ e	293,543 mtCO ₂ e	319,286 mtCO ₂ e
Sunset Farms Landfill	94,565 mtCO ₂ e	78,712 mtCO ₂ e	119,776 mtCO ₂ e
Waste Management Landfill	60,474 mtCO ₂ e	57,935 mtCO ₂ e	57,689 mtCO ₂ e
FM 812 Landfill	9,193 mtCO ₂ e	17,785 mtCO ₂ e	25,790 mtCO ₂ e
Wastewater treatment plants	32,500 mtCO ₂ e	32,500 mtCO ₂ e	32,500 mtCO ₂ e
TOTAL	466,393 mtCO₂e	480,475 mtCO₂e	555,041 mtCO₂e

Source: EPA Facility Level Information on Greenhouse Gases Tool (FLIGHT)

<http://ghgdata.epa.gov/ghgp/main.do>

end

Emissions and Business as Usual Growth

