Analysis Informing GHG from On-Road Transportation

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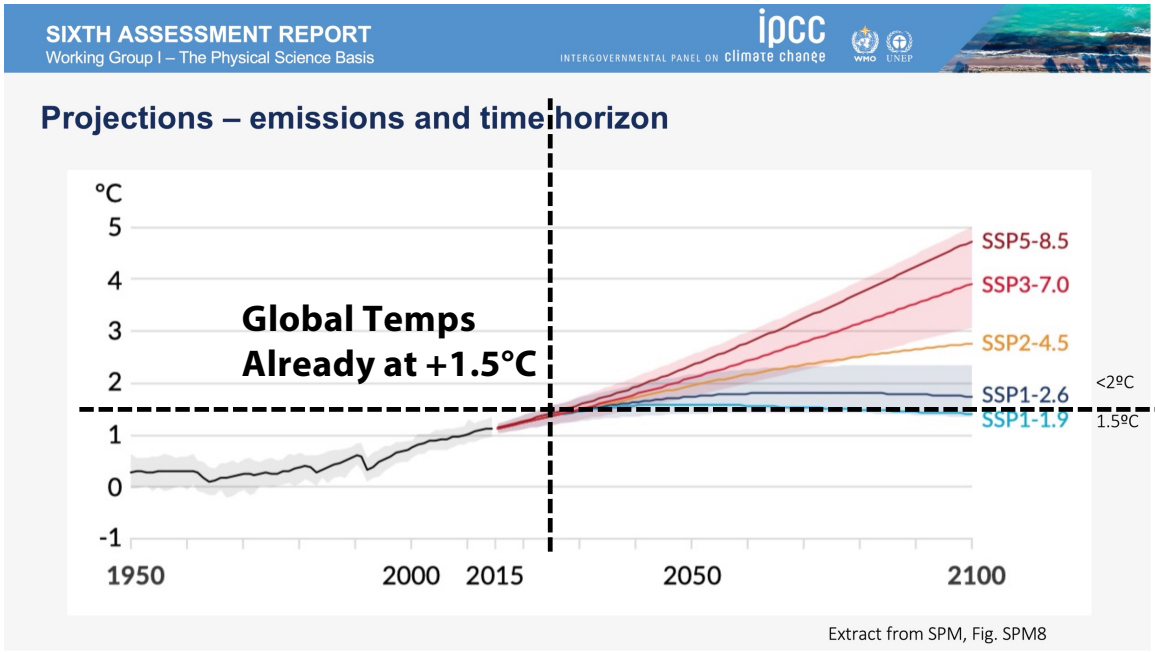
Greenhouse Gas Emissions and Global Warming



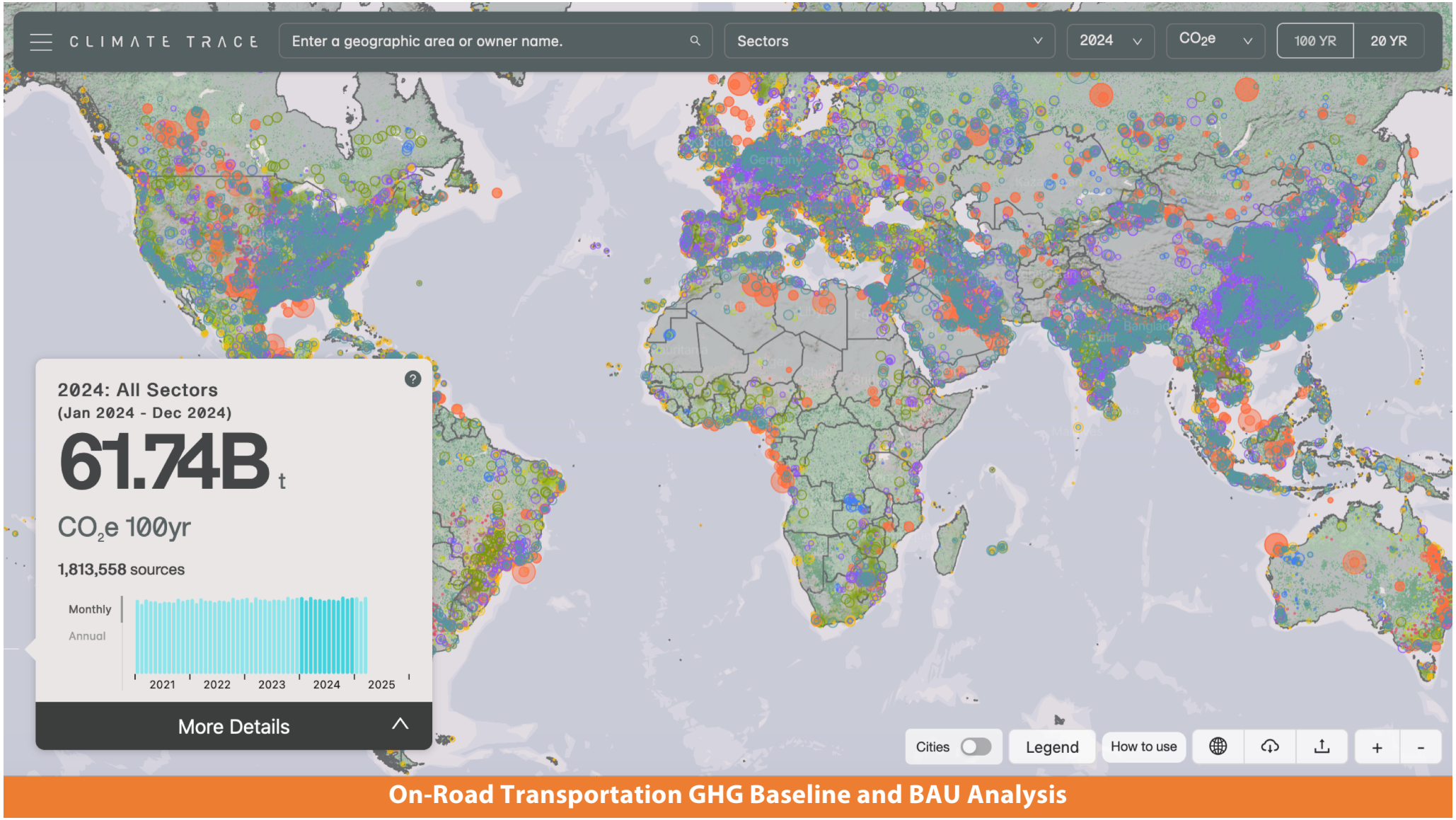
1.5C	**SSP1-1.9**	**Net Zero outcome by 2050**	**LOW**
1.8C	SSP1-2.6	Sustainable Pathway	MOD
2.7C	SSP2-4.5	Middle of the Road	HIGH
3.6C	SSP3-7.0	Regional Rivalry	HIGH

CLIMATE CHANGE IS FUELED BY GHG EMISSIONS

- **To avoid ecological collapse, global temperature cannot increase beyond 1.5ºC by 2050 compared to pre-industrial levels**
- **Need to reduce GHG emissions by 43% by 2030 (IPCC)**

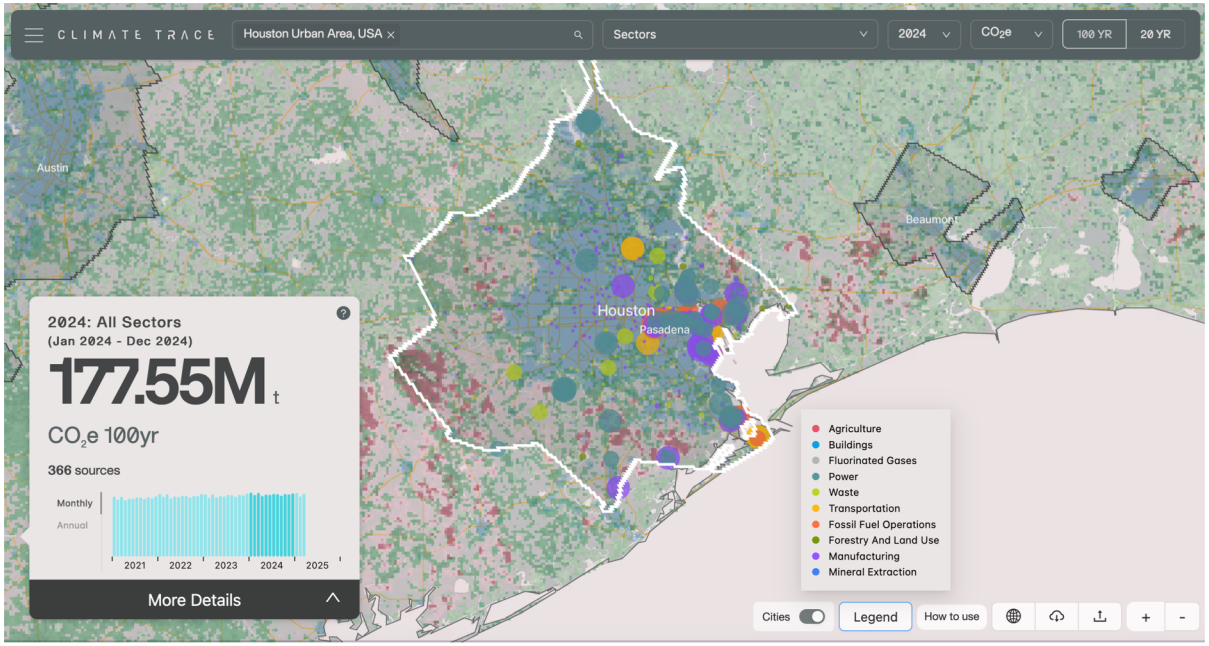
TRANSPORTATION

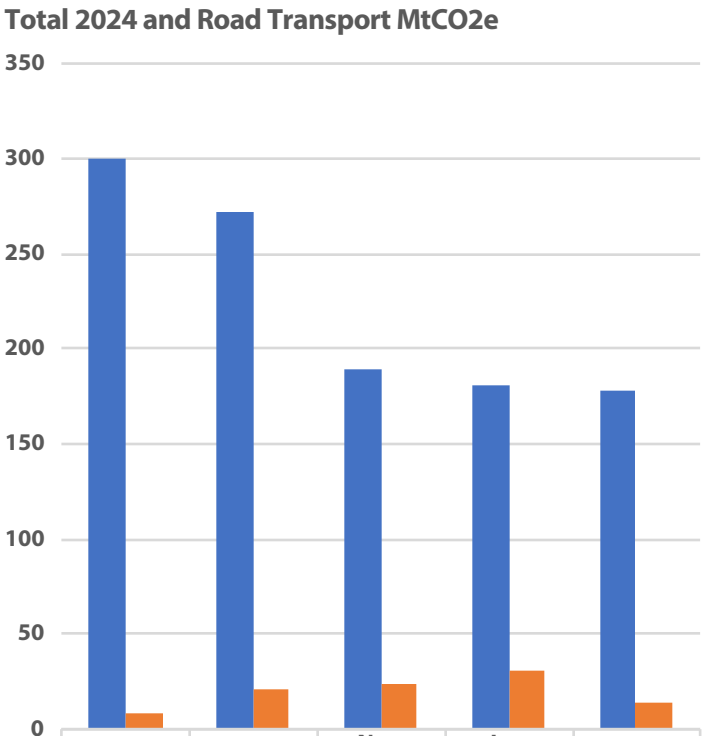
- **In US, 28% of GHG comes from transport**
- **Globally, 75% of transport GHG is from on-road emissions (IPCC)**



On-Road Transportation GHG Baseline and BAU Analysis

2024 GHG Emissions for Top Five Regions





	Shanghai, China	Tokyo, Japan	New York, United States	Los Angeles, United States	Houston, United States
2024 MtCO2e All	299.82	272.33	189.29	181.04	177.51
2024 Road Transport MtCO2e	8.2	20.56	23.1	31.48	14.43

- Climate TRACE uses databases, inventories, and artificial intelligence to track global emissions
- Houston is a **top 5** global GHG emitting region

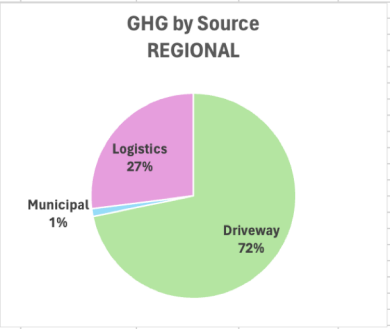
(Climate TRACE, 2024)

Estimating Annual GHG (MTCO2e) from On-Road Transportation

County	On-road Transportation	Fuel type	#C02e/gal	assumptions for MPGe	2023 Total Daily VMT	2023 Annual VMT	2023 Baseline CO2e (g)/day	2023 Baseline MTCO2e/yr	CO2e Conversion (MTCO2e/VMT)
REGIONAL									
Regional	Motorcycle	Gasoline	19.6	22.45	136,813	49,936,893	53,074,695	19,372	0.000387935
Regional	Passenger Car	Gasoline	19.6	28.43	135,403,710	49,422,354,223	41,490,987,297	15,144,210	0.000306424
Regional	Passenger Truck (Light-Duty)	Gasoline	19.6	20.38	36,204,852	13,214,770,995	15,474,444,645	5,648,172	0.000427414
Regional	Light Commercial Truck	Gasoline	19.6	19.16	8,901,767	3,249,144,989	4,045,624,311	1,476,653	0.000454474
Regional	School Bus	Gasoline	19.6	6.92	3,562	1,300,219	4,486,504	1,638	0.00125946
Regional	Refuse Truck	Gasoline	19.6	7.33	109,006	39,787,306	129,601,606	47,305	0.001188937
Regional	Single-Unit Short-Haul Truck	Gasoline	19.6	8.69	2,161,529	788,958,185	2,165,834,039	790,529	0.001001992
Regional	Single-Unit Long-Haul Truck	Gasoline	19.6	8.95	311,349	113,642,366	303,136,492	110,645	0.000973623
Regional	Motor Home	Gasoline	19.6	7.66	76,794	28,029,682	87,294,699	31,863	0.001136744
Regional	Combination Short-Haul Truck	Gasoline	19.6	4.19	159,789	58,322,816	331,777,385	121,099	0.002076353
Regional	Passenger Car	Diesel Fuel	22.2	27.57	1,505,909	549,656,605	487,708,657	178,014	0.000323863
Regional	Passenger Truck (Light-Duty)	Diesel Fuel	22.2	16.42	701,194	255,935,989	381,291,353	139,171	0.000543774
Regional	Light Commercial Truck	Diesel Fuel	22.2	13.84	498,166	181,830,769	321,243,333	117,254	0.000644851
Regional	Intercity Bus	Diesel Fuel	22.2	5.59	57,383	20,944,764	91,597,701	33,433	0.001596254
Regional	Transit Bus	Diesel Fuel	22.2	5.64	116,656	42,579,409	184,726,122	67,425	0.001583513
Regional	School Bus	Diesel Fuel	22.2	7.28	314,345	114,736,080	385,205,245	140,600	0.00122542
Regional	Refuse Truck	Diesel Fuel	22.2	5.30	106,441	38,851,114	179,293,467	65,442	0.001684433
Regional	Single-Unit Short-Haul Truck	Diesel Fuel	22.2	9.34	2,119,307	773,546,889	2,025,879,223	739,446	0.000955916
Regional	Single-Unit Long-Haul Truck	Diesel Fuel	22.2	9.69	297,704	108,662,027	274,386,562	100,151	0.000921675
Regional	Motor Home	Diesel Fuel	22.2	6.64	75,413	27,525,629	101,333,712	36,987	0.001343722
Regional	Combination Short-Haul Truck	Diesel Fuel	22.2	5.20	1,809,593	660,501,532	3,101,526,882	1,132,057	0.001713936
Regional	Combination Long-Haul Truck	Diesel Fuel	22.2	5.06	5,463,116	1,994,037,368	9,628,671,728	3,514,465	0.001762487
TOTAL						**71,735,055,848**	**81,249,125,658**	***29,655,931***	**0.000413409**

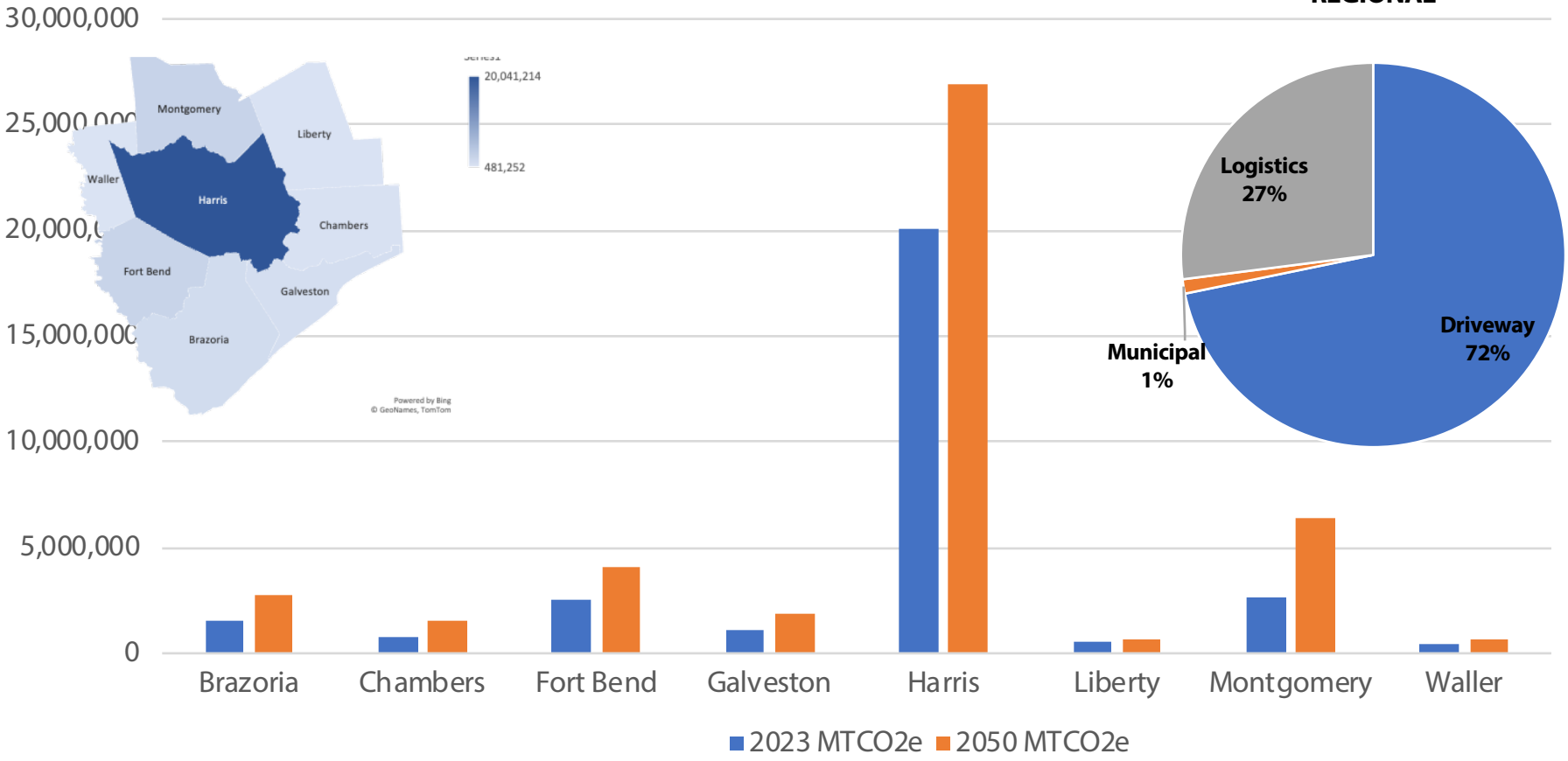
Driveway	Municipal	Logistics
21,197,789	**355,842**	**7,981,200**

SM	VMT/SM (2030)	VMT/SM (2050)
8,270.65	8,673,448	12,186,195

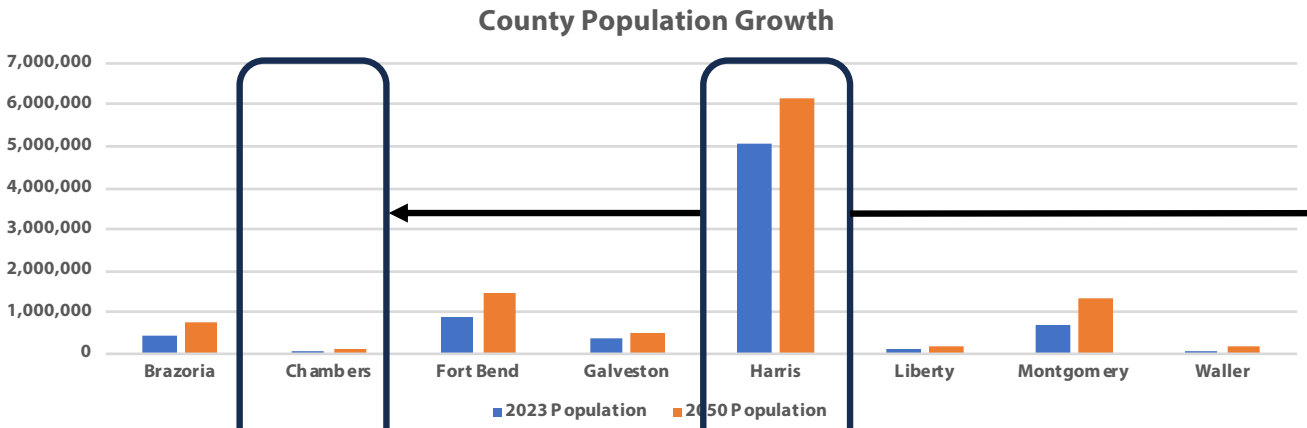


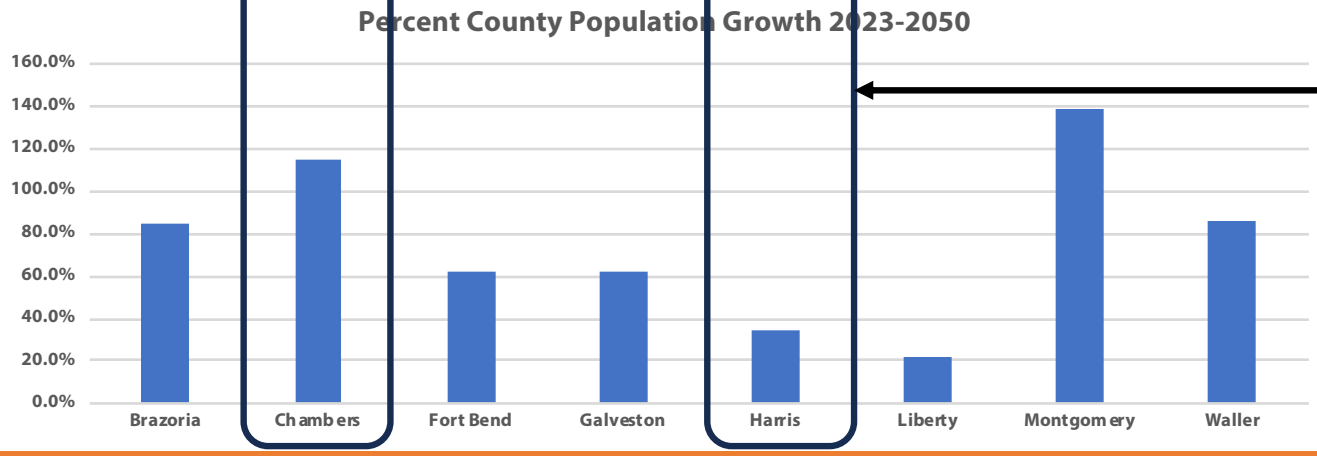
- Vehicle and fuel type
- Pounds of CO2e per gallon of fuel
- Vehicle efficiency (MPGe)
- Annual miles (VMT) for each type pf vehicle (from TTI and TxDOT)
- Organized emissions by policy areas:
    - DRIVEWAY–Personal cars and small trucks
    - LOGISTICS–Commercial vehicles
    - MUNICIPAL–Buses and refuse trucks)

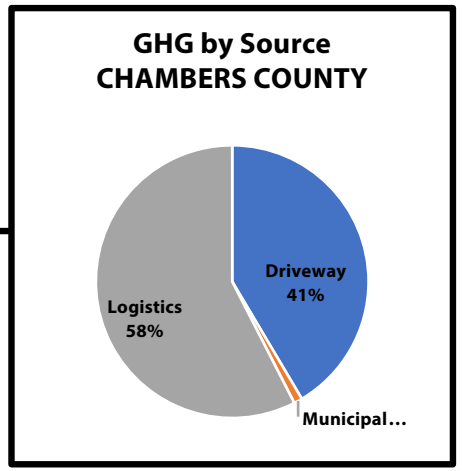
2023 GHG Baseline and 2050 BAU by County (Annual MTCO2e) ON-ROAD TRANSPORTATION

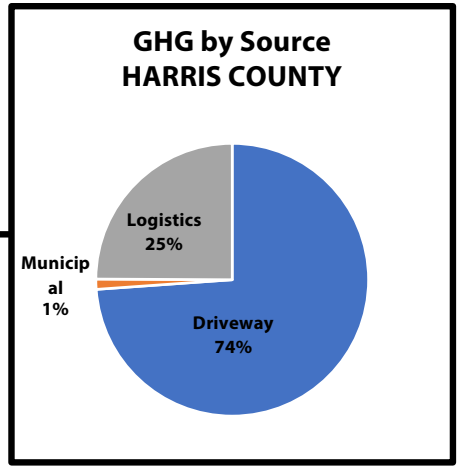


On-Road Transportation GHG Baseline and BAU Analysis



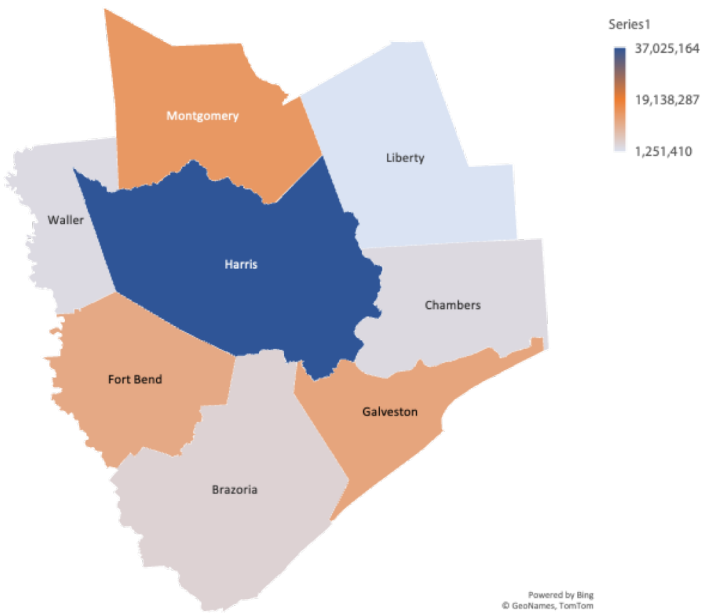


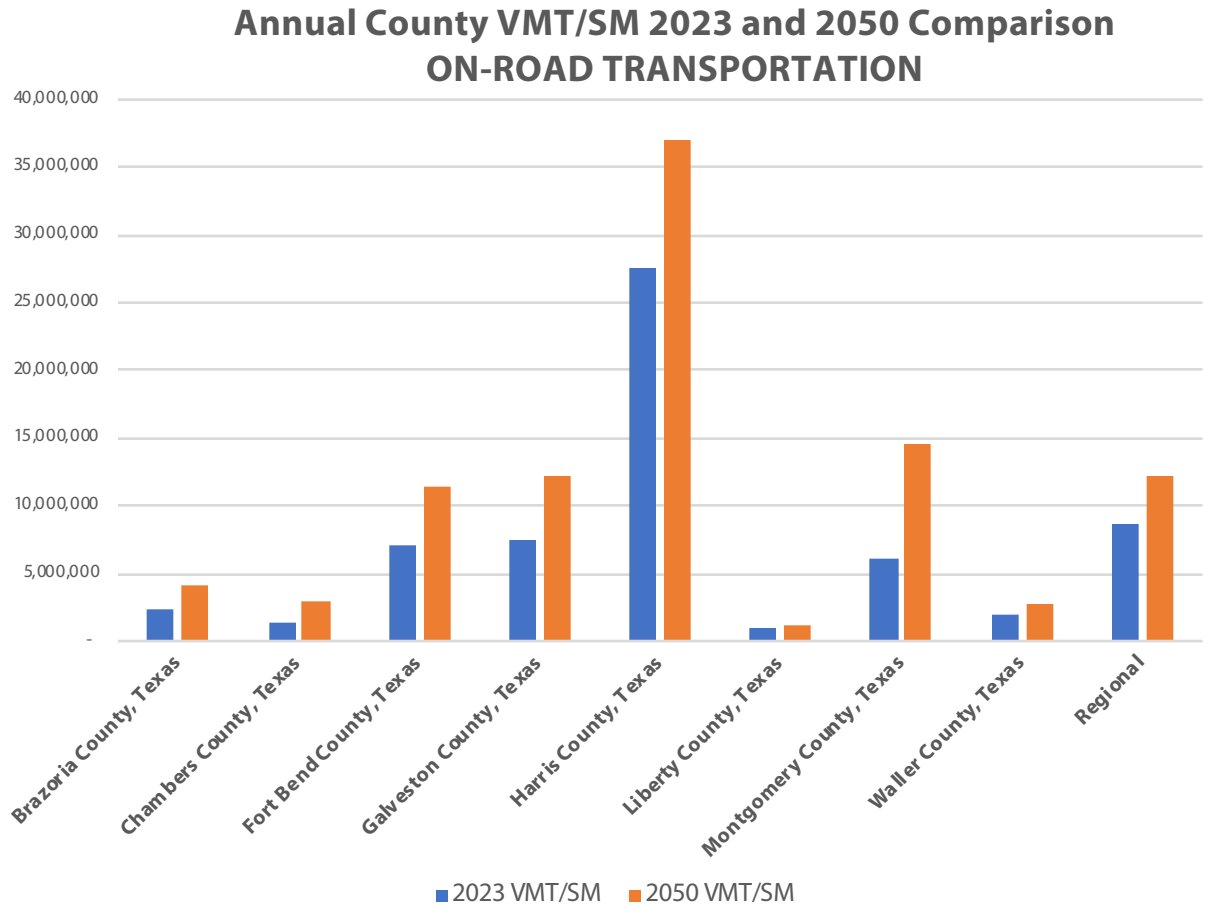




On-Road Transportation GHG Baseline and BAU Analysis

VMT Density Results in Greater PM2.5

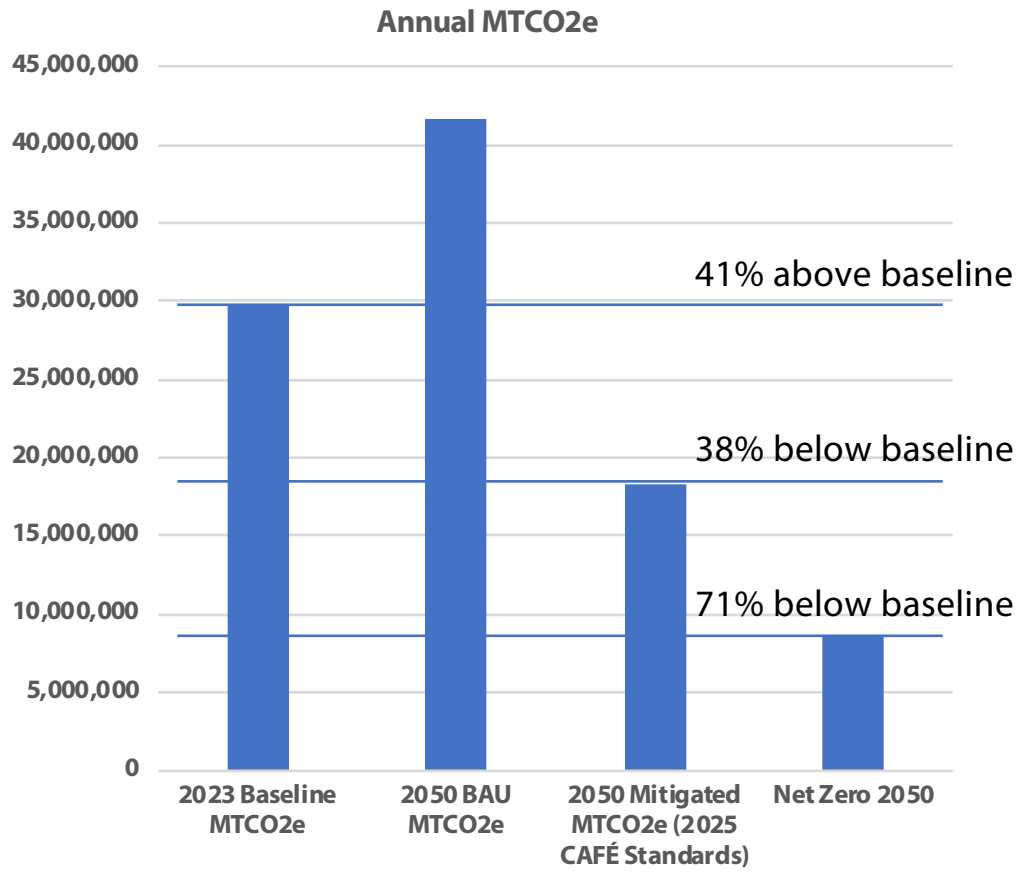




On-Road Transportation GHG Baseline and BAU Analysis

What can we do with the Baseline?

- What are the variables effecting the BAU?
- What is the potential effectiveness of various policy approaches?
- What types of strategies and actions are required to meet 2050 net zero targets?



Initial Observations

Houston is an outlier - - 5th globally for GHGF emissions and transportation represents the largest share

Counties and communities are impacted differently from climate and poor air quality impacts from on-road transportation

The region's development patterns and growth, and mix of driveway, logistics, and municipal on-road transportation sources requires custom localized solutions

Addressing GHG (and PM2.5) will require a concerted effort to switch fuels and technologies, and reduce VMT