

Medium- and Heavy-Duty Vehicles (MHDV) GHG Emissions

[CSE Research Notes on Google Drive](#)

Literature Review

- International Council on Clean Transportation (ICCT). April 2023. White Paper.
<https://theicct.org/wp-content/uploads/2023/04/hdv-phase3-ghg-standards-benefits-apr23.pdf>
 - MHDVs account for 1/3 of CO₂ emissions from on-road vehicles
 - Class 4-8 vehicles currently represent only 5% of on-road vehicle stock in the US but accounted for 32% of on-road CO₂ emissions in 2020
 - EPA 2022; EPA 2022a
 - Medium-duty vehicles have gross vehicle weights ratings between 14,000 lbs and 16,000 lbs for Class 4, between 16,001 lbs and 19,500 lbs for Class 5, and between 19,501 lbs and 26,000 lbs for Class 6. Heavy-duty vehicles have gross vehicle weight ratings between 26,001 lbs and 33,000 lbs for Class 7, and above 33,000 lbs for Class 8.
 - Major MHDV manufacturers including Daimler, Ford, Navistar, Volvo have committed to increasing ZEV sales
 - Major companies have committed to electrifying their fleet (Amazon, DHL, FedEx, Ingka Group, Walmart)
 - Current baseline emissions
 - 1503 Million tonnes = 2019 LDV + HDV Tailpipe CO₂ emissions (EPA)
 - Fully aligning the US MHDV sector with climate goals would require a 55% ZEV sales share in 2030, including a 40% ZEV sales share **for long-haul tractors**
 - There is little incentive to decarbonize long-haul trucks, yet long-haul trucks currently account for 60% of HDV CO₂ emissions in the US
 - CA has adopted Innovative Clean Transit (ICT) rule that requires 100% zero-emission transit bus purchases in 2029 and proposed the Advanced Clean Fleets (ACF) rule, which includes various ZEV adoption requirements alongside a 100% zero-emission sales requirement in 2040 (CARB, 2022); worth checking out further
 - California Air Resources Board. (n.d.). Innovative Clean Transit 2018. Retrieved June 26, 2020, from <https://ww2.arb.ca.gov/rulemaking/2018/innovative-clean-transit-2018>
 - California Air Resources Board. (2022). Proposed Advanced Clean Fleets Regulation Staff Report: Initial Statement of Reasons.
<https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acf22/isor2.pdf>
 - Classifications:
 - 1:
 - Rigid trucks (refuse trucks?)

- Tractor truck, short-haul
 - Buses
 - Tractor-truck, long-haul
- 2:
 - Class 4-8
 - Box trucks
 - Vans
 - Buses
 - Class 7-8
 - Work trucks
 - Day cab tractors
 - Class 8
 - Sleeper cab tractors
- Drayage registry - <https://ww2.arb.ca.gov/drayage-truck-registration-guidance>
- stock turnover modeled in ICCT's Roadmap model – find data if possible?
- *The U.S. EPA's motor vehicle emissions simulator (MOVES) is an emissions model that estimates emissions of criteria air pollutant and greenhouse gases for mobile sources, including MHDVs, classified by source types (United States Environmental Protection Agency, 2022). Details on MHDV source types are presented in the Appendix.
 - look into difference between this model and EMFAC
 - MOVES dataset sounds similar to EMFAC, is it more up-to-date
 - check EMFAC for GHG emissions by class, emissions over a year
 -
 - United States Environmental Protection Agency (U.S. EPA). (2022). MOVES3: Latest Version of Motor Vehicle Emission Simulator. <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>
 - U.S. EPA. (2022a). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020 (Reports and Assessments No. 430-R-22-003). U.S. Environmental Protection Agency. <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2020>
- **pretty strong section in 'climate and health social benefits of the policy scenarios' that is worth checking out

APPENDIX A: ZEV DEPLOYMENT BY MOVES SOURCE TYPE

Table A1. ZEV sales share projections by MOVES source type for the four policy scenarios in 2025, 2030, 2035, and 2040

Segment and class	2021 share	Regulatory baseline				Potential market growth				National ACT				U.S. NDC			
		2025	2030	2035	2040	2025	2030	2035	2040	2025	2030	2035	2040	2025	2030	2035	2040
Rigid truck Class 4-5	<1%	3%	12%	19%	19%	31%	61%	73%	84%	31%	61%	90%	100%	34%	65%	96%	100%
Rigid truck Class 6-7	<1%	2%	11%	17%	17%	22%	55%	70%	84%	22%	55%	81%	100%	27%	60%	92%	100%
Rigid truck Class 8	<1%	1%	7%	10%	10%	9%	34%	43%	53%	9%	34%	49%	100%	15%	48%	75%	100%
Refuse truck	0%	3%	13%	19%	19%	19%	63%	74%	84%	19%	63%	92%	100%	19%	63%	92%	100%
Tractor truck, short-haul	0%	4%	16%	21%	21%	11%	44%	50%	53%	16%	52%	100%	100%	54%	100%	100%	100%
Tractor truck, long-haul	0%	0%	0%	1%	1%	1%	16%	19%	19%	1%	16%	49%	100%	2%	40%	88%	100%
Other bus Class 6-8	<1%	0%	0%	0%	0%	17%	29%	31%	33%	17%	29%	77%	100%	25%	76%	100%	100%
School bus Class 6-8	1%	1%	1%	1%	1%	24%	32%	33%	34%	24%	51%	100%	100%	24%	66%	100%	100%
Shuttle bus Class 4-5	1%	1%	1%	1%	1%	28%	35%	37%	37%	28%	54%	100%	100%	36%	84%	100%	100%
Transit bus Class 6-8	5%	7%	10%	10%	10%	23%	53%	55%	57%	23%	77%	100%	100%	23%	100%	100%	100%
Motor homes Class 4-8	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	100%	0%	0%	50%	100%
All Class 4-8 vehicles	<1%	2%	8%	11%	11%	15%	39%	48%	56%	16%	41%	73%	100%	22%	55%	87%	100%

Class	Type	
Tractor trucks		
Class 7 tractor	Low roof	
	Mid roof	
	High roof	
Class 8 tractor (day cab)	Low roof	
	Mid roof	
	High roof	
Class 8 tractor (sleeping cab)	Low roof	
	Mid roof	
	High roof	
Heavy-haul tractor		
Vocational vehicles - diesel		
Light heavy-duty	Urban	
	Multi-purpose	
	Regional	
Medium heavy-duty	Urban	
	Multi-purpose	
	Regional	
Heavy heavy-duty	Urban	
	Multi-purpose	
	Regional	
Vocational vehicles - gasoline		
Light heavy-duty	Urban	
	Multi-purpose	
	Regional	
Medium heavy-duty	Urban	
	Multi-purpose	
	Regional	
Heavy heavy-duty	Urban	
	Multi-purpose	
	Regional	
Class 2027		
Day cab tractor trucks		
Sleeping cab tractor trucks		
Vocational trucks (diesel)		
Vocational trucks (gasoline)		

- Drayage Truck Registration Guidance – CARB: <https://ww2.arb.ca.gov/drayage-truck-registration-guidance>
 - Login: https://ssl.arb.ca.gov/trucrs_reporting/login.php
 - No lead, database only for data entry, not review
- Drayage Director: <https://www.drayage.com/directory/results.cfm?city=SBD>

the **DRAYAGE DIRECTORY**

you are here: Search Draymen > City Metro > San Bernardino -- clear -- -- new search --

Speak Other Languages Sort by Service: Rail container Type: turn off 20/40' , turn off 53' only 53' , drays: Refrigerated, ISO Tank , show Members of IANA

Show Only: HZ-Haz-Mat BD-Customs Bonded CH-Chassis TR-Transload Warehouse PK-Parking Space

Highlight: Day Cabs, Overweight, Household, Liquor, Tank Endorsed, TWIC, TSA/Airport, ELD, Cargo Insurance, turn off Driver Count, Company Drivers, O/O Drivers, Electric, Hydrogen, Chains/Binders, Tilt-Bed/Side-Lift, Accept CreditCard, Amazon, COFC

Capacity: Newest Added Carriers Most Interactive Recent Login Insights: Authority Date Inspections show MC Number show Agents

Did you know? Instead of calling each individual company, you can post an email to this group. View Intermodal Terminal's Map for SAN BERNARDINO drayage demand

19 DRAYMEN FOUND SERVING THE SAN BERNARDINO INTERMODAL REGION									
clicks	PO	only 53'	Abbreviations	#Drivers	Fav/Ban	Company (sort by)	Location (sort by)	Description	show Service Region speak Other Languages ~
Rail	20/40	53	BD CH TR PK	login	detail	Newhawk Xpress	Signal Hill, CA	Local drayage within CA LA LB Harbor and Rails ...	
Rail	20/40	53	PK	login		All Transportation Inc - Southern Calif...	Stockton, CA	[do not contact us, we are not interested in an...	
Rail	20/40	53	PK-TopPick	login		Intermodal Shippers Group Inc - ISG	Fontana, CA	Intermodal Rail drayage only (BNSF/UP Californi...	
Rail	20/40	53		login		Jay Transportation	Alhambra, CA	Containers to/from Los Angeles-Long Beach rail ...	
Rail	20/40	53	HZ	PK	login	JJ Garcia Trucking Inc.	Los Angeles, CA	Power only and rail drayage carrier - no port s...	
Rail	20/40	53	TR PK	login		Macrox Transport LLC	Sante Fe Springs, CA	53' 40' 20' container trucking services. Rail ...	
Rail	20/40	53	HZ	PK	login	Sure Shot Transit Solutions LLC	Ontario, CA	Local intermodal carrier, no port service.	
Rail	20/40	53	CH TR PK-TopPick	login		Talon Logistics, Inc.	Eastvale, CA	Southern California service for containers, tra...	
Rail	20/40	53	HZ BD	PK	login	Universal Intermodal Services, Inc.	Fontana, CA	We service all Socal rail ramps LA / LB / COI /...	
Rail	20/40	53	CH TR PK	login		Elite Drayage Carriers LLC	Long Beach, CA	Port & Rail Drayage. Rail service for ...	
Rail	20/40	53		login		Xodus Transportation LLC	Hesperia, CA	Freight hauling, rail and port container termin...	
Rail	53		PK	login		Allied Freight Systems, Inc.	Fontana, CA	No port service, rail only. Intermodal drayage ...	
Rail	53			login		Cargo Transport Logistics, Inc.	Commerce, CA	We are a 53' container intermodal trucking comp...	
Rail	53		PK	login		Celtic Cartage, Inc. (Phase II Transport...	Ontario, CA	Phase II stands out as a result of its many yea...	
Rail	53			login		Goliath Interchange Inc	Downey, CA	Rail intermodal dispatch on 53' EMHU/UMXU/CFQU ...	
Rail	53		PK	login		Mainstream Transportation Inc.	Fontana, CA	[no longer doing drayage as of Aug 2018, do not...	
Rail	53		TR PK	login		RDS Logistics Group	Fontana, CA	Intermodal Drayage with a 7.5 acre facility inc...	
Rail	53		PK	login		Redbird Carriers	Ontario, CA	Domestic Container Drayage	
Rail	53		PK	login		Sharp Transport LLC	Montclair, CA	Intermodal & shuttles, yard to yard. BNSF Hobar...	

470 (0 Co, 0 OO) total drivers for the metro/ 19 companies = 25 average

16 cached

To get all detail links... [Log In](#) ...or try [Search Draymen by Company Name](#)

...a login is free, if you let us know what profiles need updating.

Q: Why are some 'detail' links displayed and some are missing?

A: Those with a 'detail' link are on free Trial, and without links don't want to advertise.

Profiles with ✓ green check mark paid have a paid membership. (and usually want new business)

Login and you get all detail links.

Create your own custom drayage list, tag profiles as ★ 'Favorite' or ✓ 'Approved/Vetted' or ✗ 'Banned' one-at-a-time or send Excel file of SCAC

○

you are here: [Search](#) > [Intermodal Terminals](#) > [San Bernardino Region](#) > [Results](#)

SAN BERNARDINO AREA INTERMODAL TERMINALS & MAP (2) UN/LOCODE USSBT

Map Satellite

BNSF - San Bernardino

Show Traffic ☐ Weather ☐

Some markers may need adjustment, help us out and [contact us](#) with pointers that need to be moved.

Need a trucker to ingate/outgate equipment at these terminals? click here for the [Drayage Directory for San Bernardino](#)

Railroad Terminals (sort)		(sort)		FIRMS (sort)
detail -	BNSF - San Bernardino	1535 W. 4th Street	San Bernardino	CA 92411
Equipment Depots				
detail -	Fleet Yards	1333 Tippecanoe	San Bernardino	CA 92408
Drayage Trucking				
more	Draymen Serving San Bernardino Region			

Is this terminal list accurate and up-to-date?
Help us out and [contact us](#)

○ issues of where things are registered vs their domicile

- Port of Long Beach, Port of Los Angeles. July 2022. 2021 Update – Feasibility Assessment for Drayage Trucks (can't site, find non-draft version)
<https://kentico.portoflosangeles.org/getmedia/c4ceda78-54d5-44ce-bf4c-68c41f8d3a22/draft-2021-update-drayage-truck-feasibility-assessment-update>
- Department of Transportation
 - BTS Statistics: <https://www.bts.gov/>
 - Trucking & Motorcoaches: <https://www.transportation.gov/trucking-and-motorcoaches>
 - National Transportation Atlas Database – Dec 5th, 2022: <https://www.bts.gov/ntad>
 - Archived data not available - <https://www.bts.gov/geospatial/national-transportation-atlas-database/archivedata>
 - Travel Monitoring Analysis System Stations:
https://geodata.bts.gov/datasets/1e2754af87694de091640ef4131146df_0/expl ore?location=28.387756%2C-87.468871%2C3.66

- TVT data: https://www.fhwa.dot.gov/policyinformation/travel_monitoring/tvt.cfm
- National Transportation Statistics – April 30th, 2024: <https://www.bts.gov/newsroom/bts-updates-national-transportation-statistics-04302024>
 - **all aggregated to US
 - Retail Sales of New Cars by Sector: <https://www.bts.gov/content/retail-sales-new-cars-sector-thousands-vehicles>
 - Number of US Truck Registrations by Type: <https://www.bts.gov/browse-statistical-products-and-data/national-transportation-statistics/number-us-truck>
 - US Flag Vessels by Type and Age: <https://www.bts.gov/content/us-flag-vessels-type-and-age>
 - Average Length of Haul, Domestic Freight, and Passenger Modes; <https://www.bts.gov/content/average-length-haul-domestic-freight-and-passenger-modes-miles>
 - Highway System Mileage within the United States: <https://www.bts.gov/content/system-mileage-within-united-states>
- Freight Transportation: <https://www.bts.gov/topics/freight-transportation>
 -
- Vehicle Inventory and Use Survey (VIUS) – Feb 27th 2024: <https://www.bts.gov/vius>
 - <https://www.census.gov/data/datasets/2021/econ/vius/2021-vius-puf.html>
 - *Suggested Citation:* U.S. Department of Transportation, Bureau of Transportation Statistics; and, U.S. Department of Commerce, U.S. Census Bureau. (2023-12). *2021 Vehicle Inventory and Use Survey Datasets: 2021 Public Use File (PUF)*. U.S. Department of Transportation, Bureau of Transportation Statistics; U.S. Department of Commerce, U.S. Census Bureau; U.S. Department of Transportation, Federal Highway Administration; U.S. Department of Energy. Accessed [enter date you downloaded file here] from <https://www.census.gov/data/datasets/2021/econ/vius/2021-vius-puf.html>
 - Isolating to CA-registered vehicles, n=751; helpful info in highlighted fields
 - Need to review methodology
- Transportation Energy Institute: <https://www.transportationenergy.org/resources/the-commute/mhd-vehicles-dynamic-complex-and-deserving-of-special-attention>
 - MHDV Applications ranked by GHG share

TABLE 2: MHDV APPLICATIONS RANKED BY GHG SHARE

APPLICATION	VEHICLE TYPES	KEY CONSIDERATIONS	ANNUAL TRAVEL (THOUSAND MILES)	MARKET SHARE	SHARE OF GHG
Long-haul cargo	Tractors	Challenge: public infrastructure network	75–100	14%	40%
Regional cargo	Class 6–8 trucks and tractors	Driver: stakeholder's sensitivity	30–50	12%	19%
Last-mile cargo	Class 3–6 trucks and vans	Driver: stakeholder's sensitivity	12–20	31%	17%
School busing	Class 6 buses	Driver: duty cycle	10–15	5%	2%
Heavy construction	Class 6–8 trucks with superstructures (cement, dump, drilling, etc.)	Challenge: auxiliary loads	12–20	2%	2%
Refuse trucking	Class 6–8 trucks with refuse superstructure	Driver: duty cycle	20–30	1%	2%
Oil and gas	Class 6–8 tanker trucks and tractors	Challenge: public infrastructure network	25–35	1%	2%
Public transit	Class 7–8 buses	Driver: stakeholder's sensitivity	40–50	1%	2%
Light construction	Class 3–5 trucks	Challenge: public infrastructure network	5–10	8%	1%
Government	Class 3–8 trucks	Challenge: on-call services	5–10	6%	1%
Utilities	Class 3–6 trucks with boom superstructures	Challenge: on-call services	5–10	5%	1%
Agriculture	Class 3–8 trucks and tractors	Challenge: public infrastructure network	12–20	2%	1%
Tow trucking	Class 3–8 trucks	Challenge: on-call services	12–20	2%	1%
Private coach	Class 8 buses	Challenge: duty cycle	75–100	<1%	<1%
Moving	Class 3–8 trucks	Challenge: public infrastructure network	12–20	1%	<1%
Logging	Class 8 tractors	Challenge: public infrastructure network	25–35	<1%	<1%
Emergency	Class 3–8 trucks and vans	Challenge: on-call services	5–10	<1%	<1%

▪ Source: Guidehouse Insights

▪ Source Guidehouse Insights: <https://guidehouseinsights.com/>

- EPA Motor Vehicle Emission Simulator (MOVES)
 - <https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves>
- Fuels Institute. April 2022. The Easiest and Hardest Commercial Vehicles to Decarbonize.
 - Top 5 markets:
 - 5. Regional cargo
 - 4. Last-mile cargo
 - 3. Refuse trucking
 - 2. Public transit
 - 1. School busing
 - Bottom 5 markets:
 - 5. Tow trucking
 - 4. Logging trucks
 - 3. Heavy construction
 - 2. Oil and gas trucking
 - 1. Long-haul cargo

- International Council on Clean Transportation (ICCT). May 2023. Near-term infrastructure deployment to support zero-emission medium- and heavy-duty vehicles in the US. White Paper. <https://theicct.org/wp-content/uploads/2023/05/infrastructure-deployment-mhdv-may23.pdf>
- MJB&A. July 2021. Medium- & Heavy-Duty Vehicle: Market Structure, Environmental Impact, and EV Readiness. White Paper. <https://www.edf.org/sites/default/files/documents/EDFMHDVEVFeasibilityReport22jul21.pdf>
 - Market segments:








Figure 1 M/HD Market Segments	
MARKET SEGMENT	Weight Class
Heavy Duty Pickup & Van	Class 2B Class 3
Regional Haul Tractor	Class 7 - 8
Long Haul Tractor	Class 8
Transit Bus	Class 8
School Bus	Class 7
Shuttle Bus	Class 3-5
Delivery Van	Class 3-5
Delivery Truck	Class 6-7
Service Van	Class 3-5
Service Truck	Class 6-7
Refuse Hauler	Class 8
Box Truck (freight)	Class 3-5
Box Truck (freight)	Class 6-7
Box Truck (freight)	Class 8
Stake Truck (construction)	Class 3-5
Stake Truck (construction)	Class 6-7
Dump Truck	Class 8

- For each market segment the number of vehicles in the segment was estimated using registration data collected from all 50 states by IHS Markit [1]. EPA's MOtor Vehicle Emissions Simulator (MOVES3) model [2] was used to estimate the environmental impact of each market segment – from both a climate and air quality perspective.
 - The number of M/HD vehicles in each market segment was estimated using vehicle registration data collected by IHS Markit [1]. For each registered vehicle

IHS uses data encoded in the vehicle identification number (VIN) to identify vehicle attributes. The VIN-defined attributes used for this analysis include Gross Vehicle Weight Class, Fuel Type, Vehicle Type, and Manufacturer. In addition, IHS assigns a Registration Vocation based on the entity that registered the vehicle.²⁷

- Certain VIN-defined vehicle types map directly to the market segments used here – for example PICKUP, VAN CARGO, BUS SCHOOL, and TRACTOR TRUCK – because they are definitively descriptive of the final vehicle configuration. Others are more ambiguous and provide little information about the actual vehicle configuration and use – examples include CAB CHASSIS, STRAIGHT TRUCK, and INCOMPETE (STRIP CHASSIS).
- For this project, assignment of vehicles to each market segment is therefore based on a combination of VIN-defined Vehicle Type and, if necessary, IHS-defined Registration Vocation and weight class.

Figure 2 Vehicle Weight Classes and EPA Regulatory Categories

Weight Class	2b	3	4	5	6	7	8
Example Vehicles							
GVWR (lb)	8,500 to 10,000	10,001 to 14,000	14,001 to 16,000	16,001 to 19,500	19,501 to 26,000	26,001 to 33,000	>33,000
Engine Regulatory Category	Light Heavy-Duty				Medium Heavy-duty		Heavy Heavy-Duty
Vehicle Regulatory Category							
	Heavy Duty Pickup & van						
	Vocational Trucks					Combination Trucks	

Source: U.S. Environmental Protection Agency

Figure 3 U.S. In-use Medium- & Heavy-duty Fleet by Market Segment

MARKET SEGMENT	Weight Class	EPA Phase 2 Regulatory Category		Estimated In-use Vehicles	
		Engine	Vehicle	Number	% of Fleet
Heavy Duty Pickup & Van	Class 2B	LHD	HD Pickup & Van	8,951,335	39.3%
	Class 3	LHD	HD Pickup & Van	2,330,763	10.2%
Regional Haul Tractor	Class 7 - 8	MHD, HHD	Combination Trucks	1,094,056	4.8%
Long Haul Tractor	Class 8	HHD	Combination Trucks	2,057,164	9.0%
Transit Bus	Class 8	HHD	Vocational Ve Urban	77,720	0.3%
School Bus	Class 7	MHD	Vocational Ve Urban	497,201	2.2%
Shuttle Bus	Class 3-5	LHD	Vocational Ve Urban	149,773	0.7%
Delivery Van	Class 3-5	LHD	Vocational Ve Urban	500,110	2.2%
Delivery Truck	Class 6-7	MHD	Vocational Ve Urban	400,969	1.8%
Service Van	Class 3-5	LHD	Vocational Ve Urban	808,802	3.5%
Service Truck	Class 6-7	MHD	Vocational Ve Urban	296,999	1.3%
Refuse Hauler	Class 8	HHD	Vocational Ve Urban	101,401	0.4%
Box Truck	Class 3-5	LHD	Vocational Ve Regional	162,731	0.7%
Box Truck	Class 6-7	MHD	Vocational Ve Regional	172,354	0.8%
Box Truck	Class 8	HHD	Vocational Ve Regional	153,776	0.7%
Stake Truck	Class 3-5	LHD	Vocational Ve Mixed Use	391,348	1.7%
Stake Truck	Class 6-7	MHD	Vocational Ve Mixed Use	191,925	0.8%
Dump Truck	Class 8	HHD	Vocational Ve Mixed Use	247,475	1.1%
OTHER	Class 3 - 8	LHD,MHD,HHD	Vocational Ve Mixed Use	4,216,527	18.5%
				22,802,427	100.0%

Source: IHS Markit, M.J. Bradley & Associates

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- EPA estimates that in 2020 the M/HDV fleet consumed 55.3 billion gallons of fuel and emitted 561 million metric tons (mill MT) of greenhouse gases (GHG), 1.5 million MT of nitrogen oxides (NOx) and 38,000 MT of particulate matter (PM)¹¹ [2].
- **see example fleet electrification commitments for list of companies

Methods ?

- Set up classification for MHDV
- Identify larger fleets, companies, etc.
- Estimate fleet size
 - IHS Markit data / DMV (?) ask James
 - James (access); Ben (ins-and-outs)
 - From MJB&A. July 2021. Medium- & Heavy-Duty Vehicle: Market Structure, Environmental Impact, and EV Readiness. White Paper
 - The number of M/HD vehicles in each market segment was estimated using vehicle registration data collected by IHS Markit [1]. For each registered vehicle IHS uses data encoded in the vehicle identification number (VIN) to identify vehicle attributes. The VIN-defined attributes used for this analysis include Gross Vehicle Weight Class, Fuel Type, Vehicle Type, and Manufacturer. In addition, IHS assigns a Registration Vocation based on the entity that registered the vehicle.²⁷

- Certain VIN-defined vehicle types map directly to the market segments used here – for example PICKUP, VAN CARGO, BUS SCHOOL, and TRACTOR TRUCK – because they are definitively descriptive of the final vehicle configuration. Others are more ambiguous and provide little information about the actual vehicle configuration and use – examples include CAB CHASSIS, STRAIGHT TRUCK, and INCOMPETE (STRIP CHASSIS).
 - For this project, assignment of vehicles to each market segment is therefore based on a combination of VIN-defined Vehicle Type and, if necessary, IHS-defined Registration Vocation and weight class.
- Convert fleet size to GHG emissions
 - Potentially for environmental impact as well – EPA MOVES3
 - Grab MHDV-related emissions from:
 - <https://fueleconomy.gov/>
 - <https://www.epa.gov/greenvehicles/learn-about-fuel-economy-label>

4/30/2024

- investigate EMFAC vs MOVES
- find DMV data
 - assuming registration == domicile for right now
- differentiating MHDVs for fleets in the area that is SPECIFIC to the logistics industry
 - VIUS data is for all of CA; ratio of
- review EMFAC and extrapolate out how much emissions per vehicle (compare to subregion values)
 - normalize by light-duty vehicles
 - grabbing all EMFAC data, normalizing across the state
 - identifying if there is a unusually large peak in the region that we can attribute to warehousing

5/8/2024

- initial investigation into fleet size (normalized by total fleet size and per capita) doesn't show a trend that highlights San Bernardino or Riverside
- looking further into EMFAC and running model specifically for GHG and environmental data
 - pulling data aggregated to each county is taking a while, still exploring
 - need to normalize by LDV when data is available
- James - look into the types of vehicles specifically associated with warehousing (with the categories of MHDVs provided by EMFAC - e.g., we can ignore dump trucks and should focus on interstate delivery, etc.)
-