

# Quantifying Greenhouse Gas Emissions From Transit

DRAFT APTA Recommended Practice



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# APTA Guidance

- ▶ Provide standardized way for transit agencies to quantify GHG impacts
- ▶ Accessible to all types of agencies
- ▶ Collective effort by APTA working group
- ▶ Public review version available soon

# Why Quantify Emissions?

- ▶ Reporting to The Climate Registry
- ▶ Support internal efforts
- ▶ Communicate transit's benefits
- ▶ Potential funding

Climate Action Registry Reporting Online Tool (CARROT)

Log Out Comments  
April 18, 2003

Status Summary Entity Info Users Emissions Data Reports Help

Submit Report

Reporting Year: 2003  
Revision Number: 000  
Entity Reporting Status: Initiated  
Reporting Scope: CA  
Reporting Level: Entity

**Tips:**

- Click the 'Submit' button to submit the emissions data to the registry, or the 'Cancel' button to continue working on the emissions data.
- Click the 'Help' hyperlink on the menu bar to bring up the user manual.

**Orange Oil**

Please verify that your emissions data is accurate and complete before submitting it for certification:

**Emissions Summary (California)**

GH Gas	Stationary	Mobile	Process	Fugitive	Indirect	Total	Unit
CO2	100.49	175.62			15.03684	291.14684	metric ton
<b>Total (CO2e)</b>	100.49	175.62			15.03684	291.14684	metric ton

**Emissions Summary (US)**

GH Gas	Stationary	Mobile	Process	Fugitive	Indirect	Total	Unit
CO2	100.49	175.62			15.03684	291.14684	metric ton
<b>Total (CO2e)</b>	100.49	175.62			15.03684	291.14684	metric ton

Submit Cancel

Image: California Climate Action Registry

## Emissions Produced by Transit

## Emissions Displaced by Transit

### Emissions from Transit

*Tailpipe emissions from transit vehicles*

*Electricity use for traction*

*Maintenance yards, stations, offices and other stationary sources*

### Mode Shift

*Avoided car trips from private autos*

### Congestion Relief

*Improved fuel efficiency from reduced congestion*

### Land-Use Multiplier

*Compact land-use -> shorter trips, more walk/bike trips*

*Trip chaining*

*Lower/no car ownership*

*Debit*

*Credit*

## Greenhouse Gas Impacts of Transit

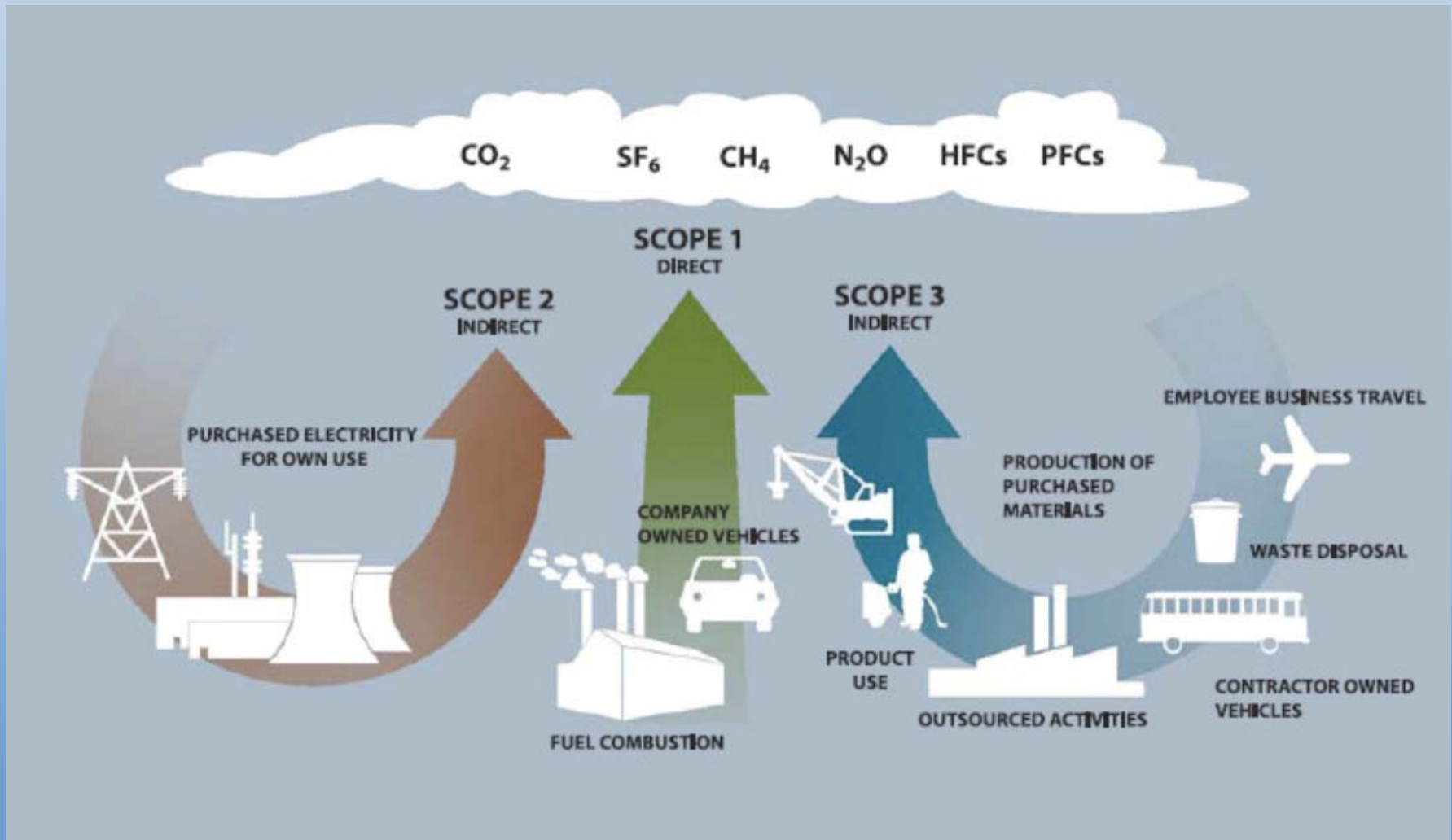
# Debit Side:

## How to quantify emissions from transit

# Emissions from Transit

- ▶ Consistent with existing guidance
  - Climate Registry General Reporting Protocol
  - Local government protocol
- ▶ Give guidance on transit-specific issues
  - What emissions are covered
  - Data sources (mainly NTD)

# Emission Scopes



Source: The Climate Registry General Reporting Protocol

# What to Include?

## ▶ Emissions from:

- Directly operated and contract services reported to NTD
- Includes paratransit and vanpools
- Non-revenue vehicles
- Stationary and fugitive sources



## ▶ Most capital projects are Scope 3



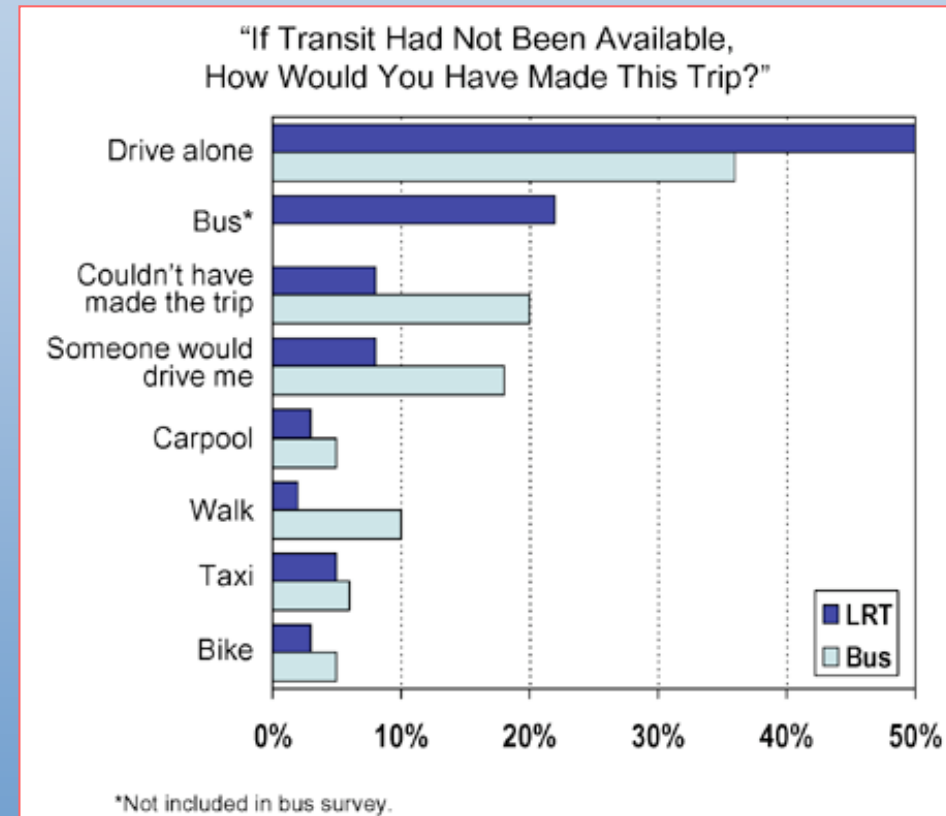
# Sources of Emissions

Source	Scope	Santa Barbara MTD		AC Transit	
		Tons CO <sub>2</sub> -e	%	Tons CO <sub>2</sub> -e	%
Mobile Combustion	1	5,687	95%	64,379	93%
Stationary Combustion	1	27	0.5%	1,965	3%
Process Emissions	1	0	0%	0	0%
Fugitive Emissions	1	1	0%	0	0%
Purchased Electricity	2	264	4%	2,568	4%
Purchased Steam	2	0	0%	0	0%
Purchased Heat/Cooling	2	0	0%	0	0%
<b>Total</b>		<b>5,979</b>	<b>100%</b>	<b>68,912</b>	<b>100%</b>

# Credit Side: How to quantify emissions saved

# Mode Shift to Transit

- ▶ Apply mode shift factor to transit passenger miles
- ▶ Tiered options
  - A. Model based
  - B. Survey based
  - C. Defaults by agency type



Source: Met Council, Minneapolis

# Mode Shift Factor

**Q1. If transit service were not available, how would you make this kind of trip?**

Drive alone    Taxi    Someone would drive me    Carpool    Walk    Bicycle    I would not make the trip

$\div$  average carpool occupancy

**Q2. If transit service were to stop permanently, would your household change the number of vehicles it owns?**

Yes - purchase a vehicle    Yes - give up a vehicle    No

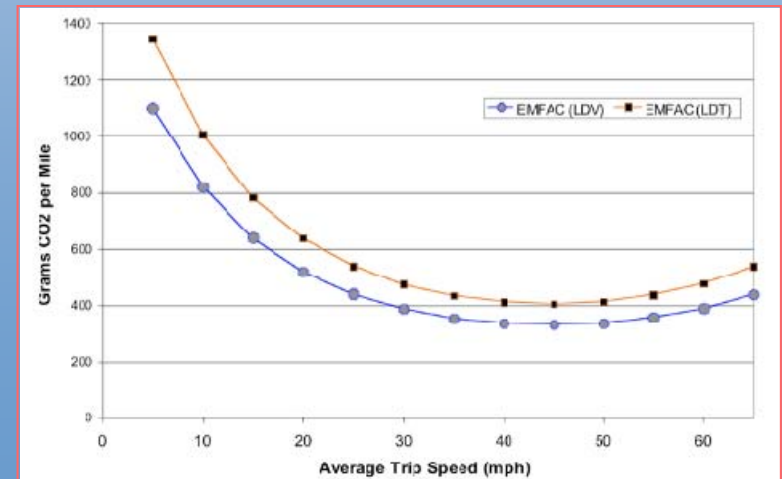
**Q3. Do you have a car or other personal vehicle that you could have used to make this trip?**

No    Yes

**Mode Shift Factor**

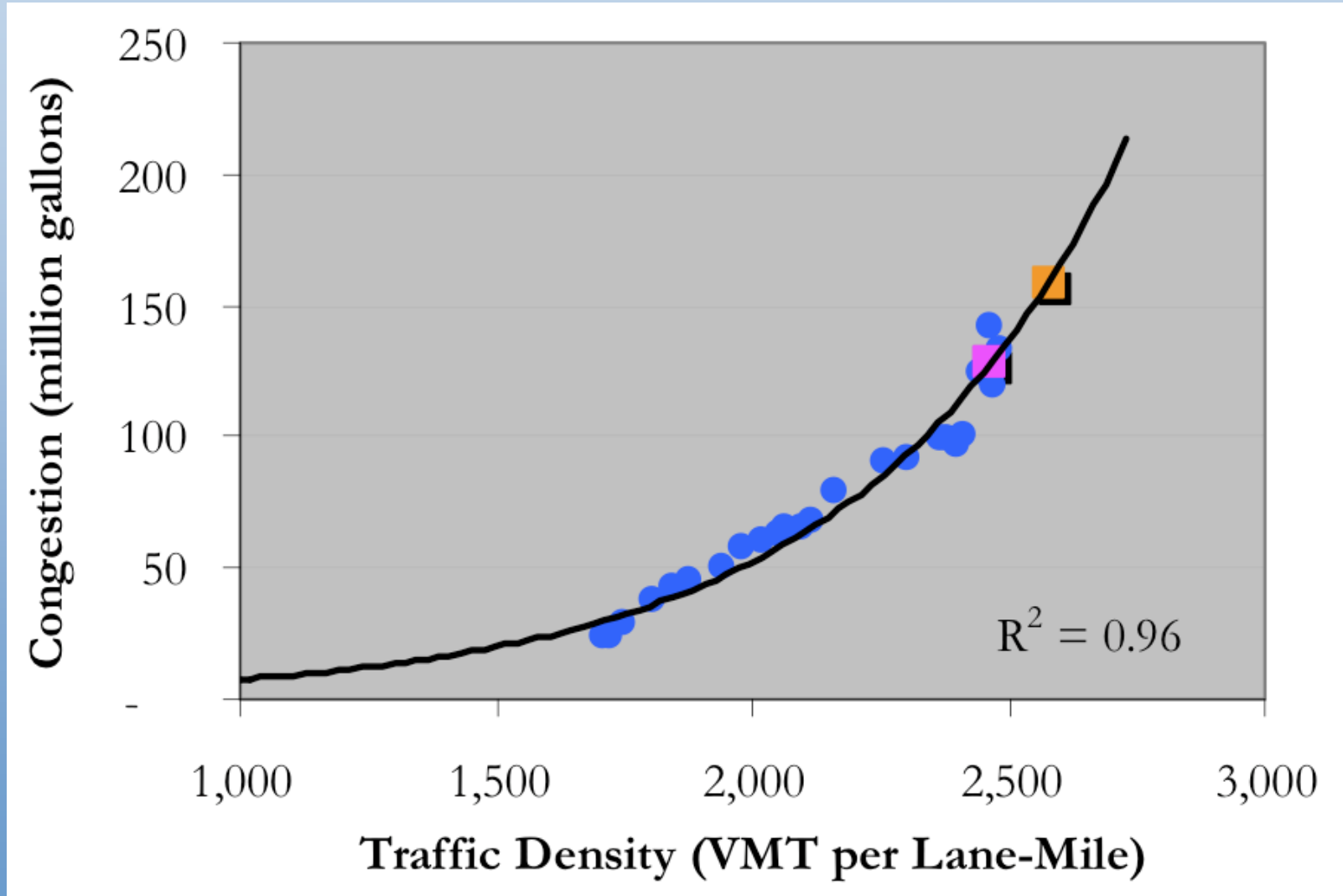
# Congestion Relief

- ▶ Mode shift to transit reduces congestion
- ▶ Improves efficiency of remaining vehicles
- ▶ Approaches
  - Extrapolate from TTI
  - Regional models



Source: Ewing et. al. 2008

# Congestion Relief



*Thanks to Justin Antos*

# Land-Use Multiplier

▶ Accounts for:

- Reduced trip length
- Bike, ped trips
- Trip chaining
- Lower car ownership

Study	Cities	Land-Use Multiplier	Methodological Issues
Pushkarev & Zupan (1982)	Large U.S. metro areas	4	Correlation only
Newman & Kenworthy (1999)	32 global cities	5 to 7	Correlation only
Holtzclaw (2000)	SF Bay Area	1.4 to 9	Correlation only
Neff (1996)	U.S. urban areas	5.4 to 7.5	Assumes fixed travel-time budgets
ICF (2008)	Entire U.S.	1.9	Accounts only for LU effects <i>caused</i> by transit

▶ Challenge: chicken and egg

# Recommended Approach

- ▶ Preferred approach: regional study
- ▶ Alternative: default multiplier of 1.9
  - Multiply mode shift benefit by 1.9
  - Conservative approach for many regions





# Summary

- ▶ Standardized way to quantify GHG impacts
- ▶ Based on accepted protocols
- ▶ Gives credit for the credit side - emissions reduced
- ▶ Simple calculations understate the benefits



# For More Information

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This presentation:

[www.stanford.edu/~adammb/MillardBall\\_Railvolution2008.pdf](http://www.stanford.edu/~adammb/MillardBall_Railvolution2008.pdf)

