

Transit and Land Use: Impacts of Interaction for Energy Use and GHG Emissions

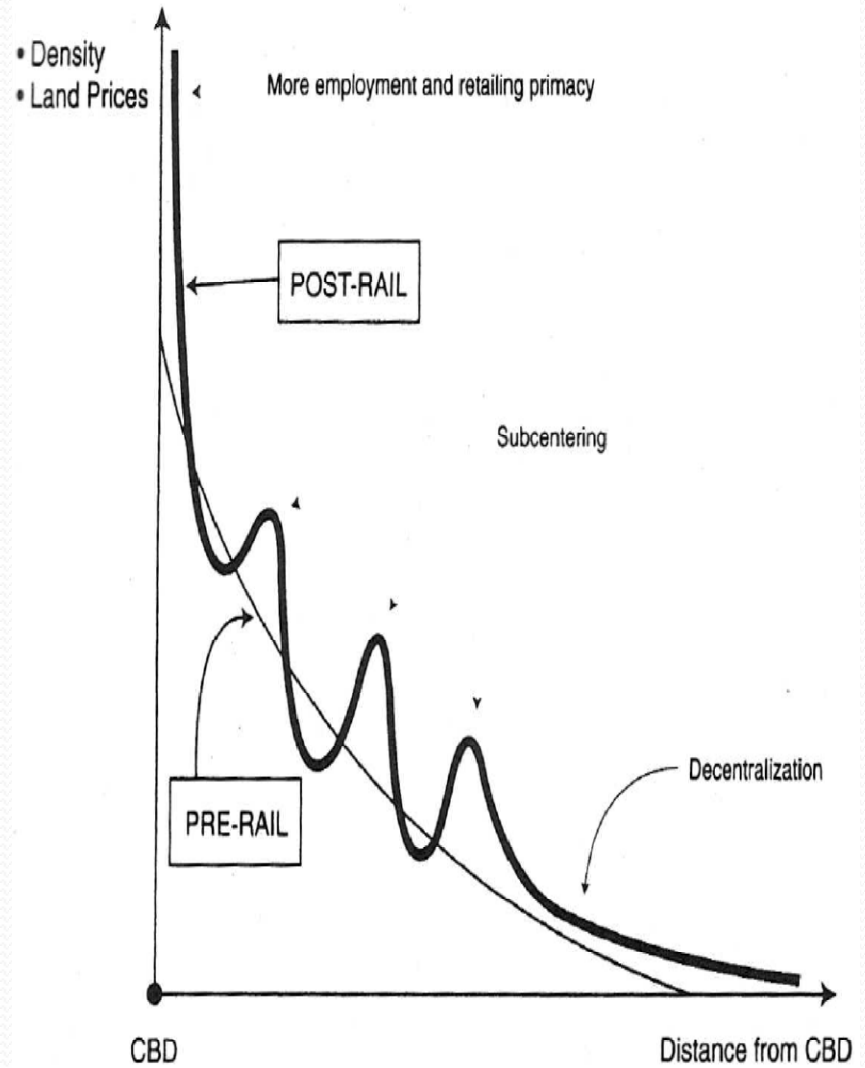
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Jack Faucett Associates

For the Air & Waste Management Association (AWMA)
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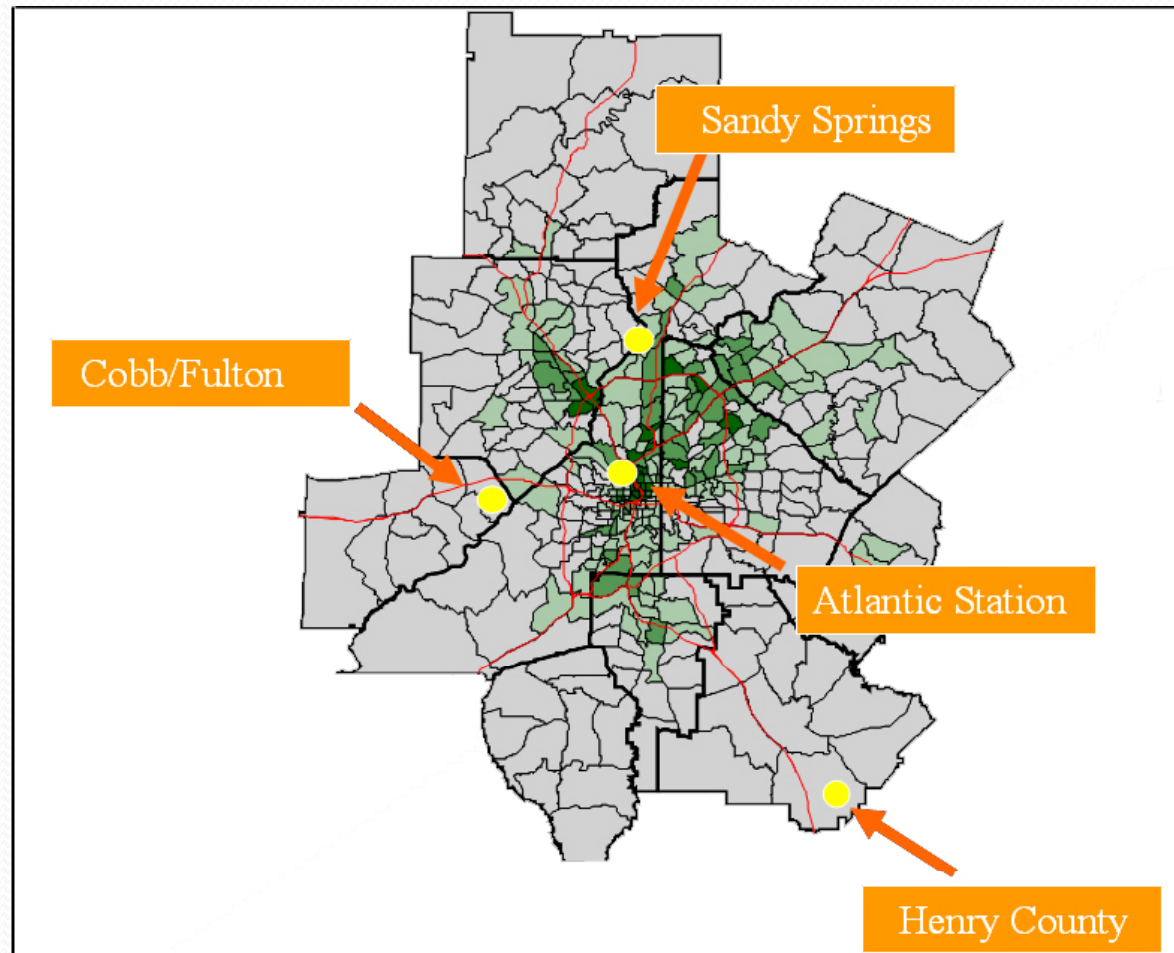


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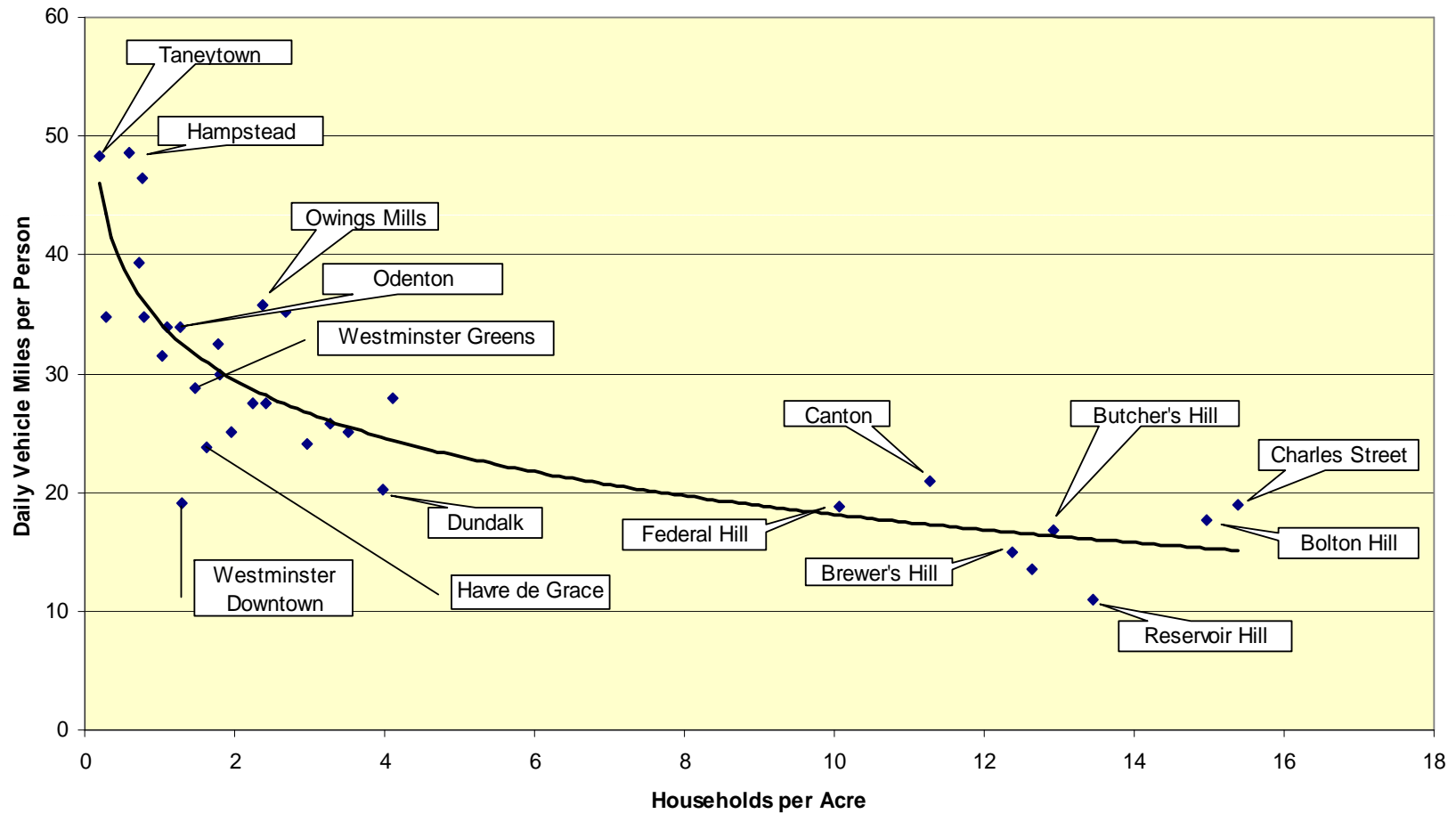
Infill and TOD analysis for Atlanta Metro Region:

Atlantic Steel/Atlantic Station site simulation showed 35% less driving and emissions than comparable sites.



Daily Vehicle Miles per Person vs. Residential Density

Source: Baltimore Metropolitan Council, 2001 Travel Survey



Global Comparisons Show Gradient of Per Capita Transportation Energy Use in Urban Areas

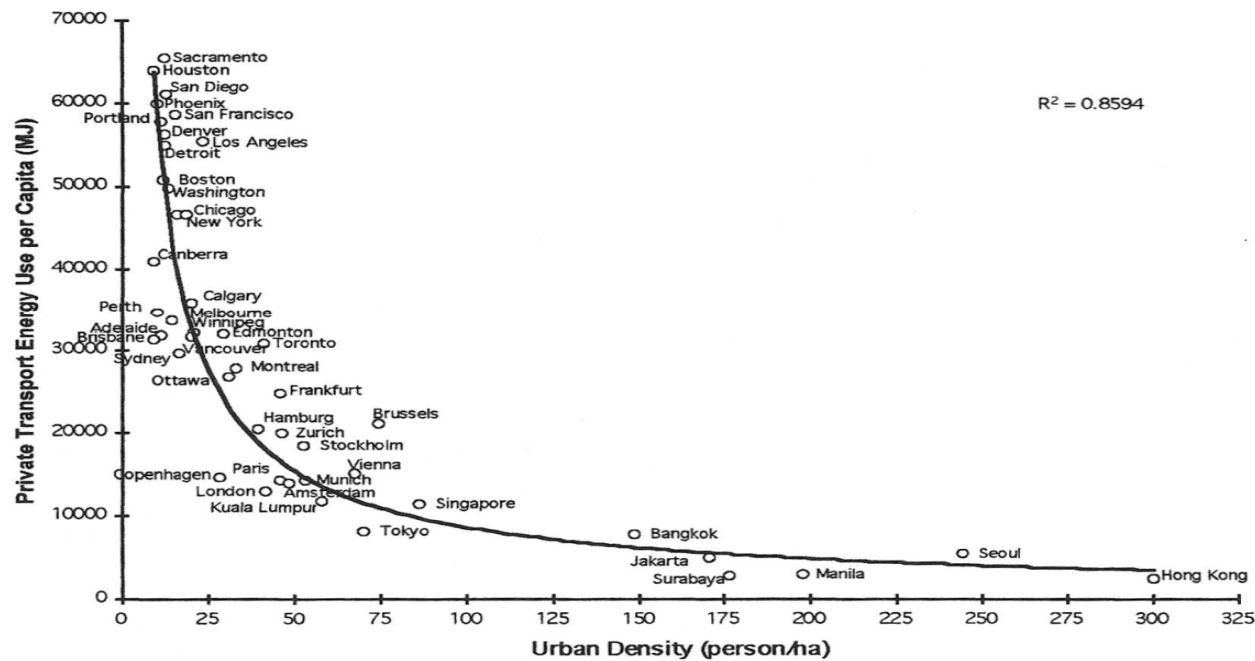


Figure 3.2. Energy use per capita in private passenger travel versus urban density in global cities, 1990.



Lessons from World Bank sponsored Newman and Kenworthy work comparing US and global metro areas

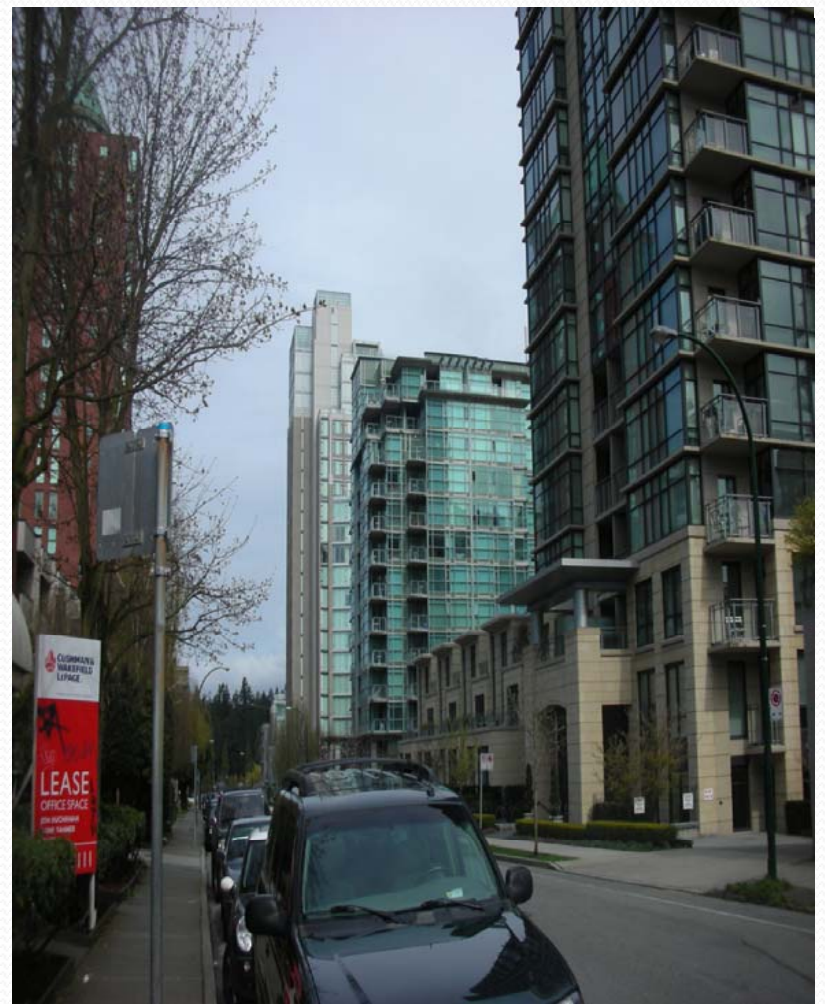
1. Overall Density (Compactness)
2. Strength of Core Area as Locus of both Population and Employment
3. Auto Ownership and Use Costs
4. Transit Capacity and Service



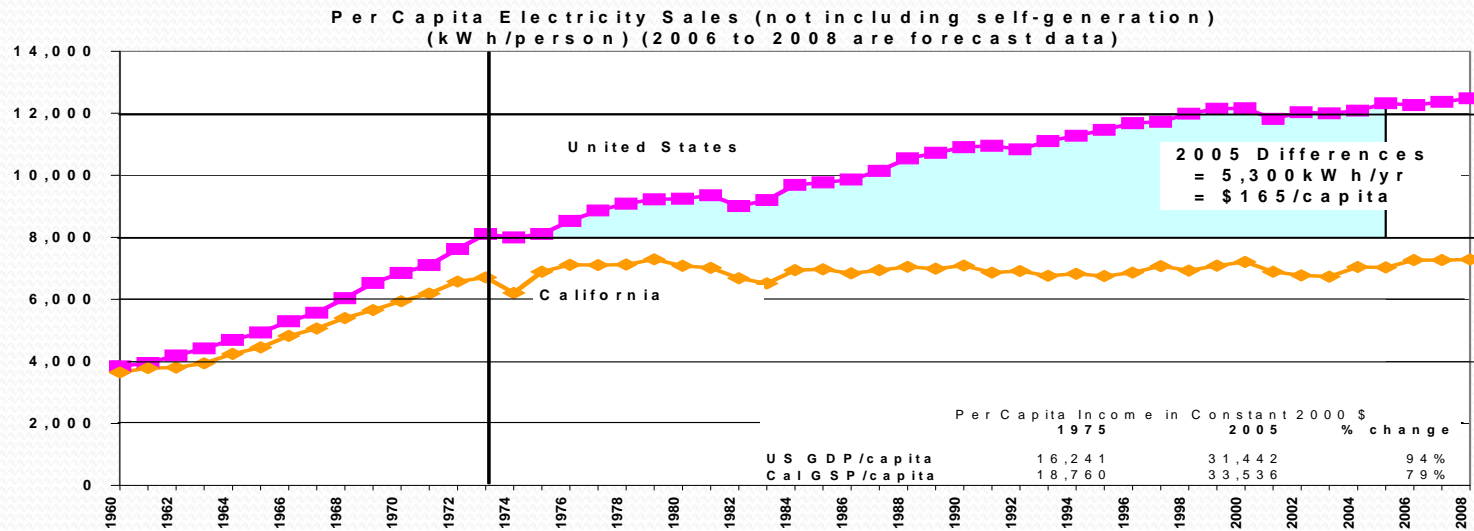
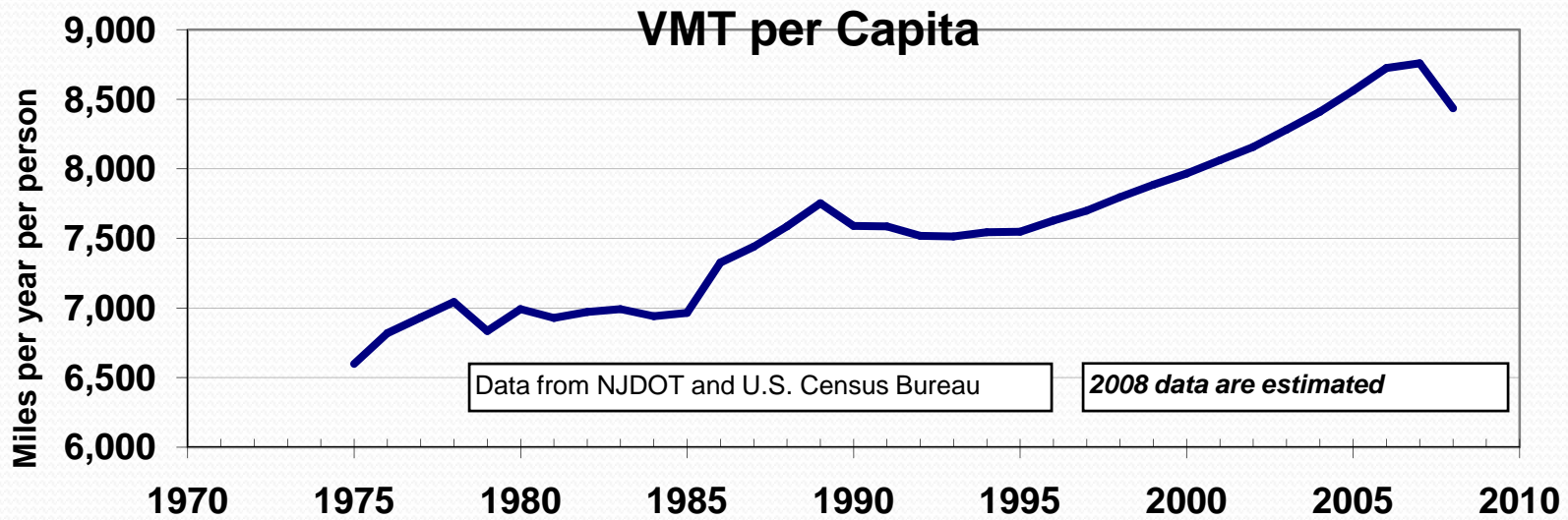
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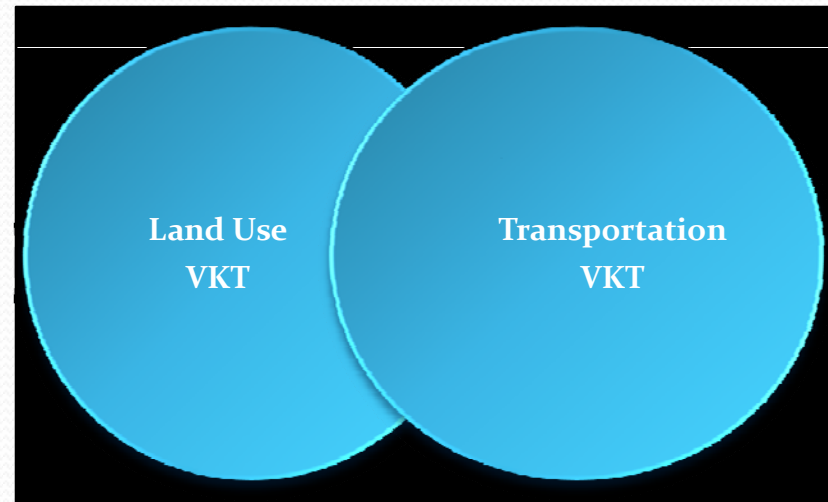
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Transit Infrastructure and Land Use



- How Does Transit and Land Use Interact ?



Transit reduces (displaces) GHG emissions in three ways:

1. Mode Shift (transit riders make fewer private vehicle trips)
2. Congestion Relief
3. Associated Land Use changes (i.e. land use multiplier)



TRANSIT ASSOCIATED REDUCED GREENHOUSE GAS EMISSIONS

- Transit reduces (displaces) Scope 3 GHG emissions in three ways:
 1. Mode shift(transit riders take less private vehicle trips)
 2. Congestion relief
 3. Land use changes (i.e. land use multiplier)
- APTA provides guidance on how to estimate each of these GHG reduction mechanisms at the transit agency level

Initial results from Kentucky

TARGET Estimates of (1) Total and
(2) Incremental Transit Associated Reduced Emissions for Kentucky Transit Agencies

	GHG Reductions (MMtCO ₂ e)			Net Present Value (Million \$2005)	Cost- Effective- ness (\$/tCO ₂ e)	Energy Savings (Million gallons fuel saved in 2030)
	2020	2030	Total			
			(2011– 2030)			
(1) Kentucky Transit Agencies <u>Total</u> Reduction Estimate	0.20	0.32	4.21	-\$767	-\$182	26.64
(2) Kentucky Transit Agencies <u>Incremental</u> Reduction Estimate	0.07	0.15	1.56	-274	-174	12.48

(1) TARGET Results for Transit Total Displaced Emissions in Kentucky with transit agency specific estimates

Transit Agency	Location	GHG Reductions			Net Present Value (Million \$2005)	Cost-Effectiveness (\$/tCO ₂ e)	Energy Savings (Million gallons fuel saved in 2030)
		(MMtCO ₂ e)					
		2020	2030	Total (2011–2030)			
Lexington Transit Authority	Lexington	0.02	0.04	0.50	-\$86	-\$173	3.13
Transit Authority of River City	Louisville	0.13	0.21	2.80	-\$507	-\$181	17.82
Transit Authority of Northern Kentucky	Fort Wright	0.04	0.07	0.92	-\$174	-\$190	5.69
Sum of Three Agencies	Kentucky	0.20	0.32	4.21	-\$767	-\$182*	26.64

* Average

(2) TARGET Results for Transit Incremental Displaced Emissions in Kentucky with transit agency specific estimates

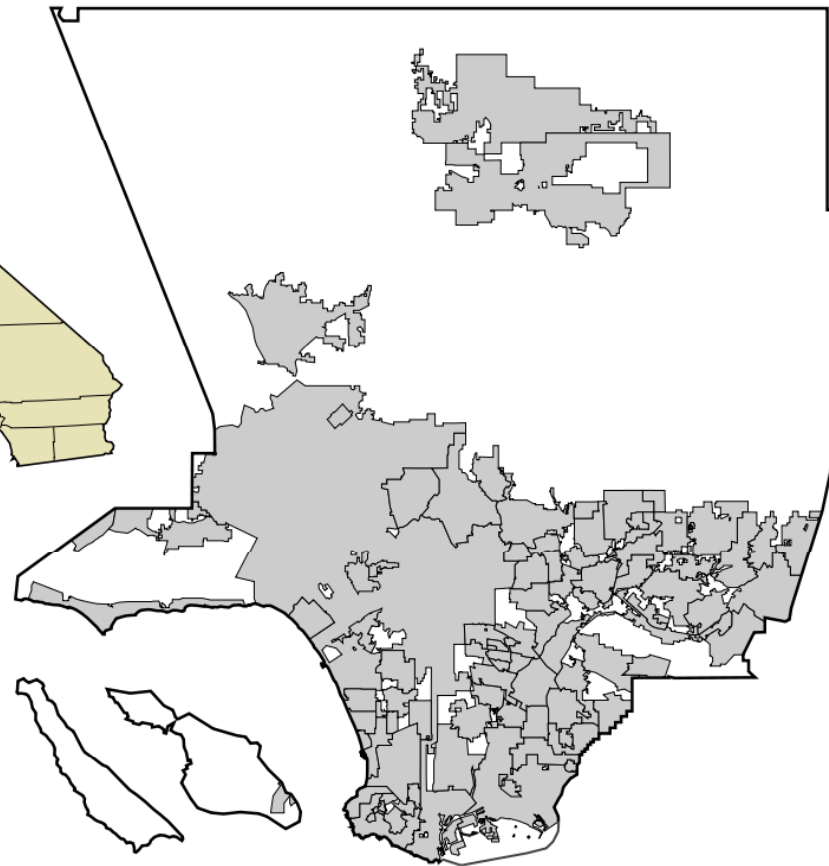
Transit Agency	Location	GHG Reductions			Net Present Value (Million \$2005)	Cost-Effectiveness (\$/tCO ₂ e)	Energy Savings (Million gallons fuel saved in 2030)
		(MMtCO ₂ e)					
		2020	2030	Total (2011–2030)			
Lexington Transit Authority	Lexington	0.01	0.02	0.19	-\$32	-\$165	1.55
Transit Authority of River City	Louisville	0.05	0.10	1.01	-\$178	-\$176	8.14
Transit Authority of Northern Kentucky	Fort Wright	0.02	0.03	0.35	-\$64	-\$182	2.78
Sum of Three Agencies	Kentucky	0.07	0.15	1.56	-274	-174*	12.48

* Average

Public Transit and Land Use in Los Angeles County

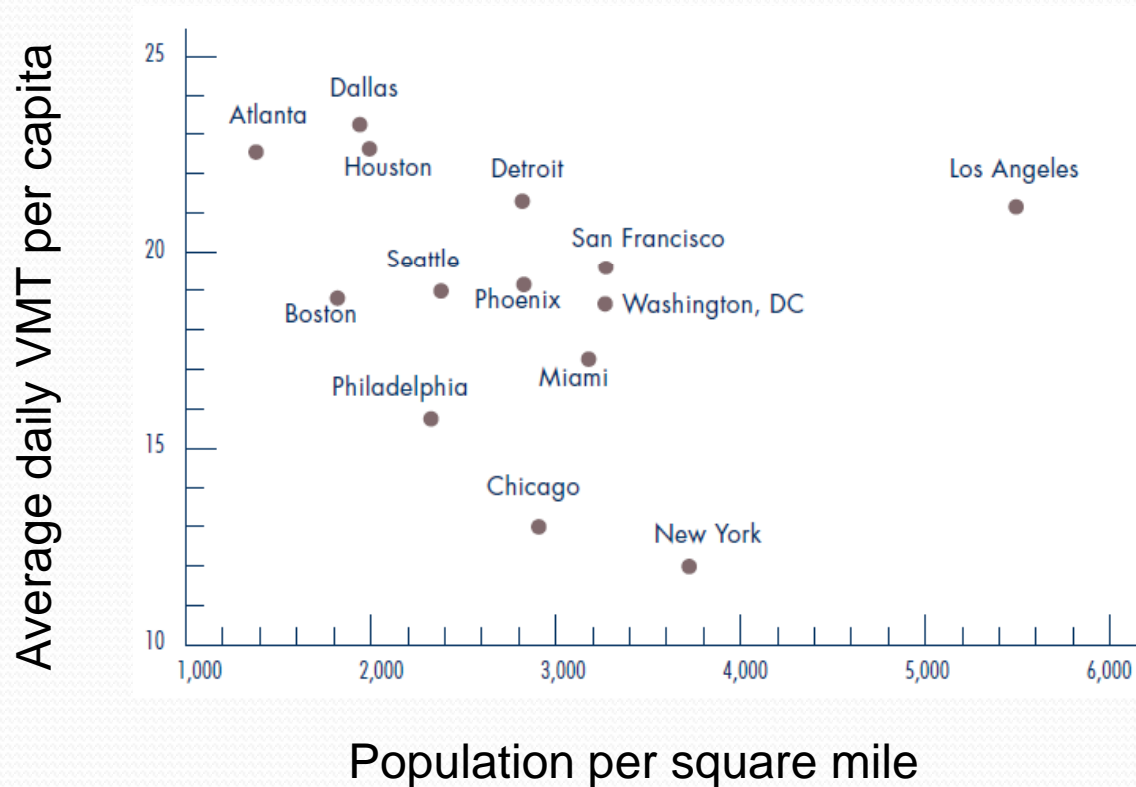
Initial Analysis of
Census Tract Characteristics

U.S., California, and LA County Maps



LA Metropolitan Region Has a Unique Density to VMT per Capita Ratio

- LA region has high density and high VMT per capita





Objective

- To use census level data to examine the relationship between transit commute mode share and census tract characteristics
- Characteristics include
 - Demographics (age)
 - Proximity of various types of public transportation stops
 - Housing and Population Density
 - Streetscape

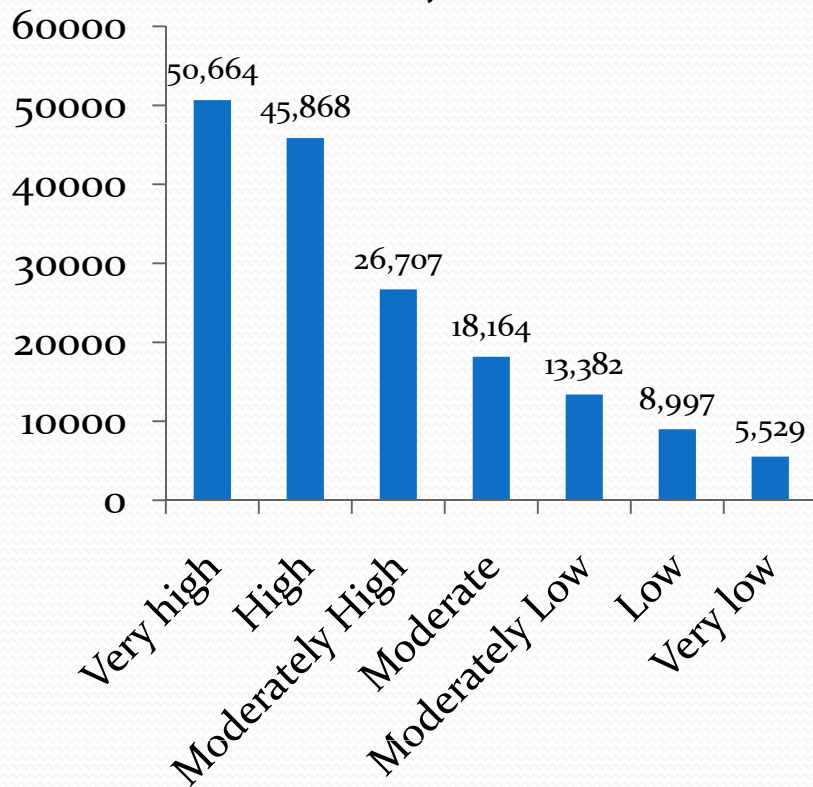


Data

- American Community Survey (2004-2009 5 year estimates) from the US Census Bureau for all L.A. County Census Tracts
 - Mode share, vehicle ownership
- 2010 U.S. Census Data from the US Census Bureau for all L.A. County Census Tracts
 - Population and housing density
- Google map
 - Proximity of transit stops and streetscape

How do these areas differ in terms of density?

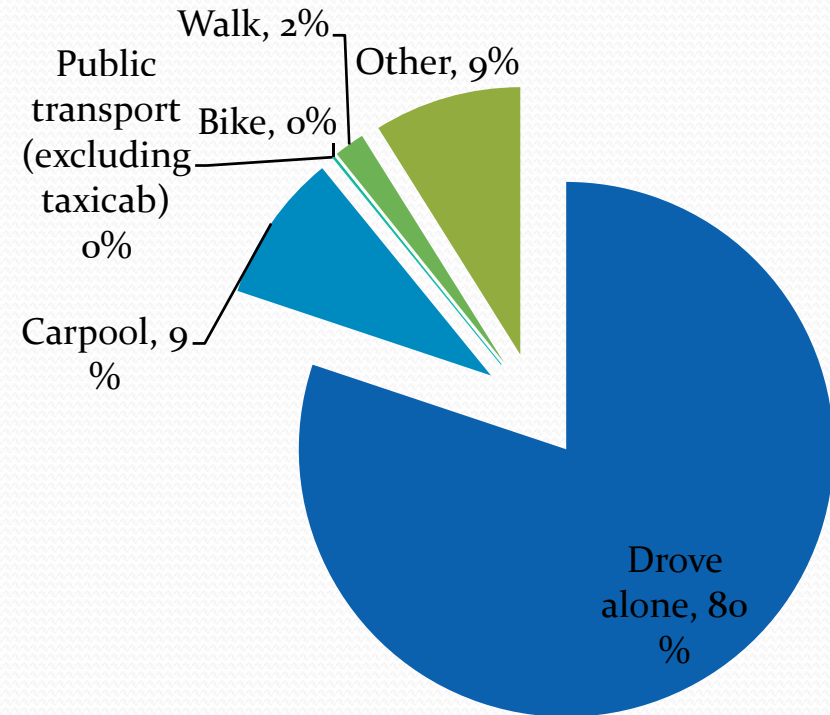
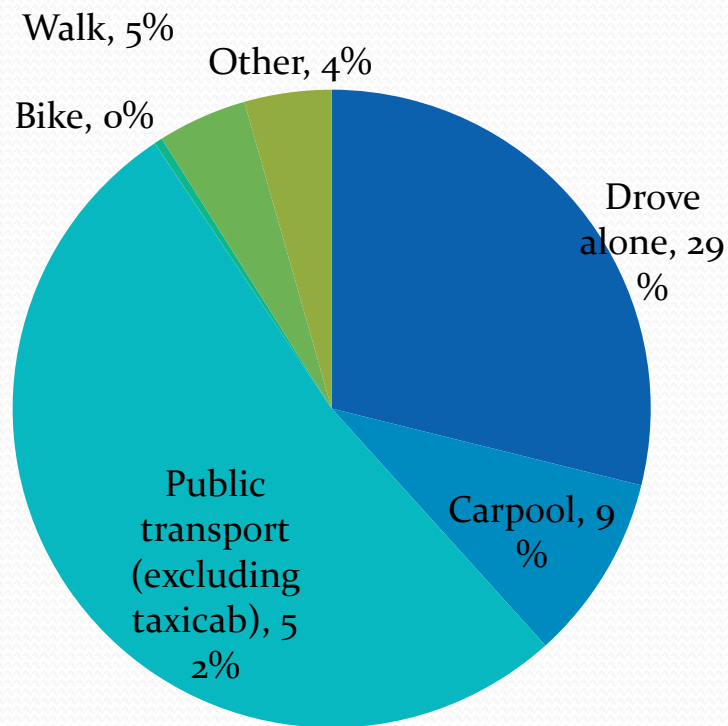
Average Population Density of LA County Census Tracts by Prevalence of Transit as Commute Mode, 2005-09



	Percent of Labor Force Taking Public Transit to Work
Very high	Greater than or equal to 60%
High	Greater than or equal to 40% but less than 60%
Moderately High	Greater than or equal to 20% but less than 40%
Moderate	Greater than or equal to 10% but less than 20%
Moderately Low	Greater than or equal to 5% but less than 10%
Low	Greater than or equal to 1% but less than 5%
Very low	Less than 1%

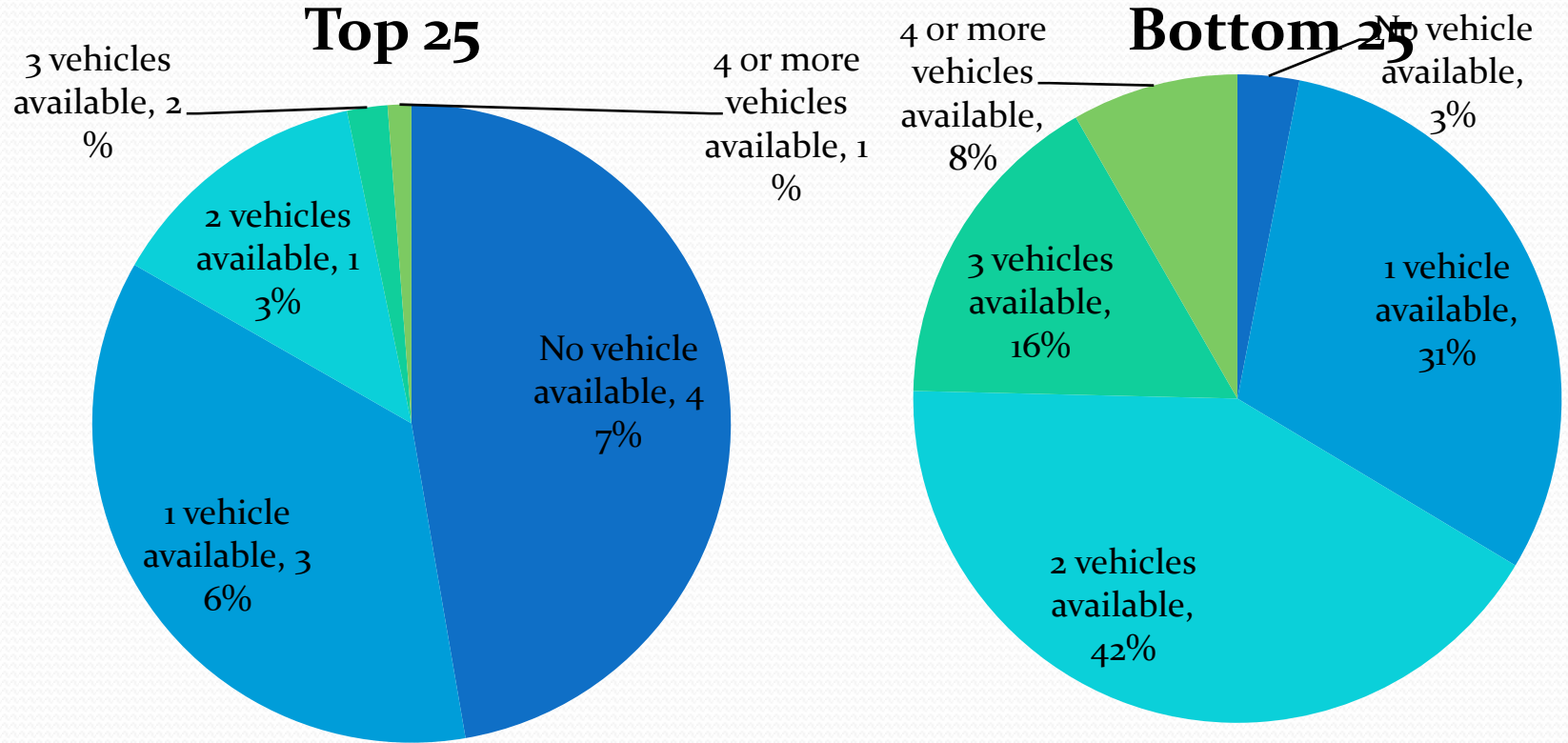
Analysis of Top 25 and Bottom 25

Comparison of Commute Mode Share Top 25 Bottom 25



Analysis of Top 25 and Bottom 25

Comparison of Vehicle Ownership





Analysis of Top 25 and Bottom 25

- Population Density
 - **Top 25**
 - Range from 5,711 persons per mi² to 90,703 persons per mi²
 - Combined average population density of 31,005 persons per mi²
 - **Bottom 25**
 - Range from 833 persons per mi² to 24,282 persons per mi²
 - Combined average population density of 4,250 persons per mi²
- Housing Density
 - **Top 25**
 - Range from 1,892 housing units per mi² to 29,988 housing units per mi²
 - Combined average population density of 11,357 housing units per mi²
 - **Bottom 25**
 - Range from 509 housing units per mi² to 10,650 housing units per mi²
 - Combined average population density of 1,467 housing units per mi²



Analysis of Top 25 and Bottom 25

- Presence of bus stop within $\frac{1}{2}$ mile of center of census tract
 - **Top 25 : 100%**
 - **Bottom 25 : 64%**
- Presence of metro or light rail stop within 1 mile of center of census tract
 - **Top 25 : 84%**
 - **Bottom 25 : 8%**



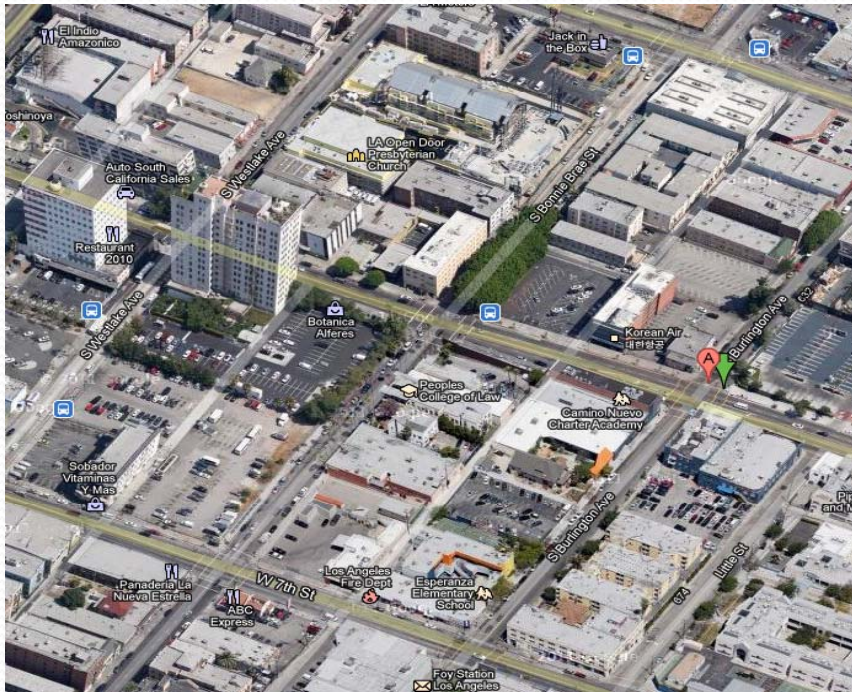
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Visual Example of High Use and Low Use Census Tracts

High Use Census Tract

Low Use Census Tract



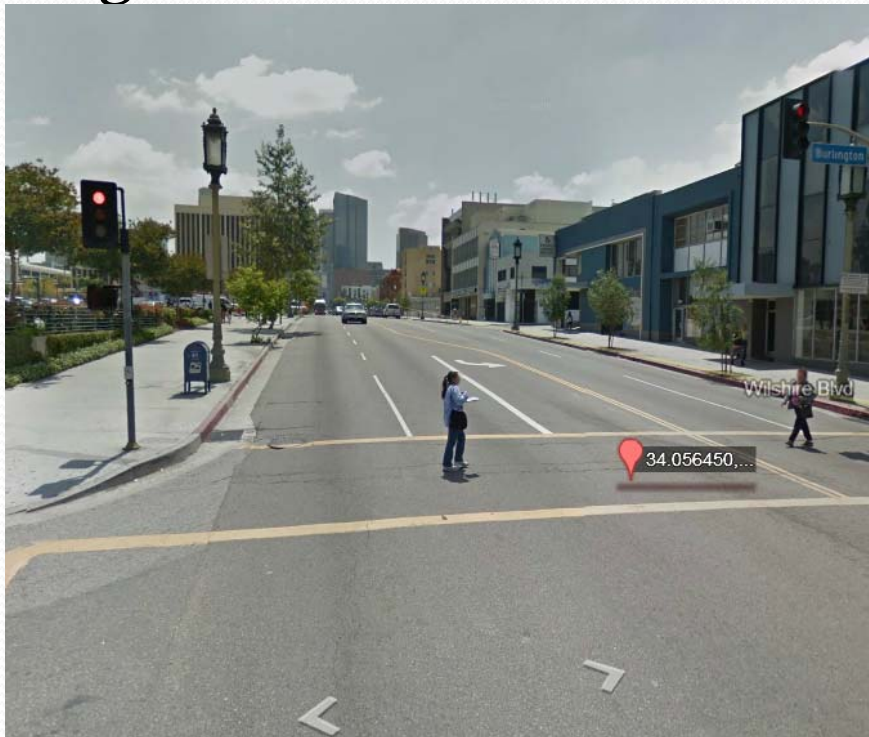
Census Tract 2089.02, LA County, CA
County, CA

Census Tract 1343.03, LA

Visual Example of High Use and Low Use Census Tracts

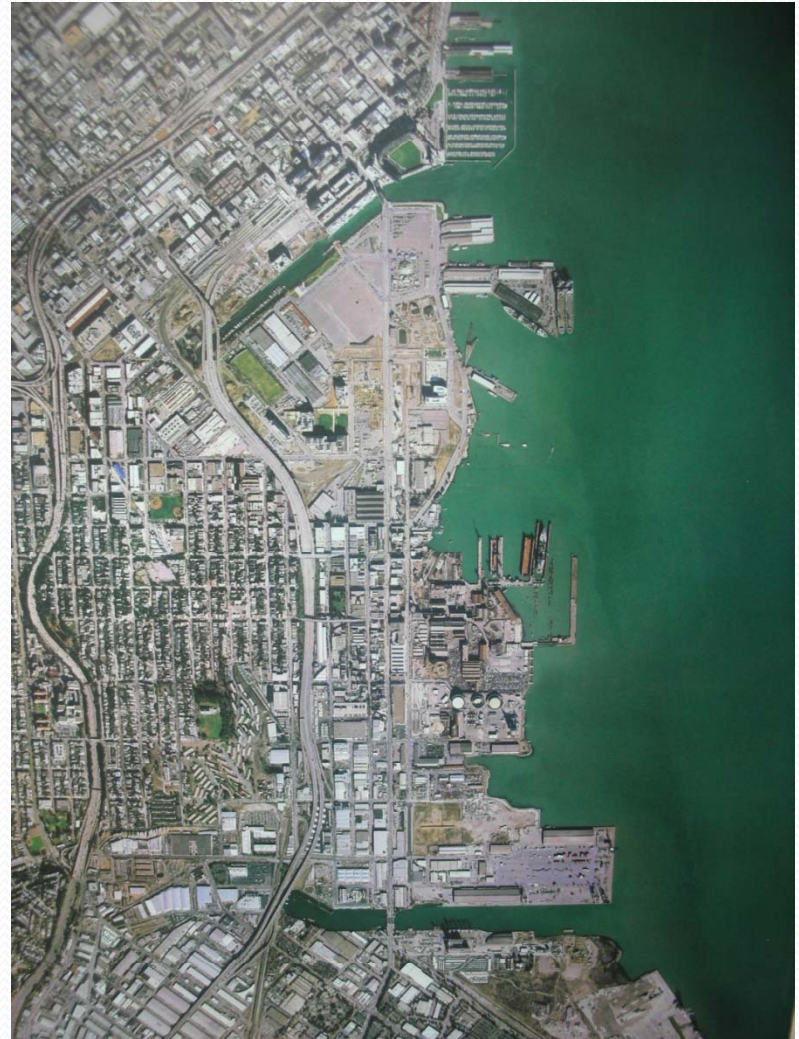
High Use Census Tract

Low Use Census Tract



Census Tract 2089.02, LA County, CA
County, CA

Census Tract 1343.03, LA



Thank you for your interest:

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