

Vision California  
**URBAN  
 FOOTPRINT**



*Next  
 Generation  
 Open Source  
 Sketch Model &  
 Data Ecosystem*



SCAG Modeling Task Force

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 September 26, 2012



## Urban Footprint in the SCAG region

- ✓ UrbanFootprint Overview
- ✓ Potential to Assist Regional & Local Planning
- ✓ Future Improvements





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- ✓ Potential to Assist Regional & Local Planning
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Vision California  
**URBAN**  
**FOOTPRINT**

**Model Includes:**

- Automated base data loading
- 35+ Place type library
- 90+ Building type library
- Scenario translation engine
- Thin-Client GUI
- Web-based scenario painter
- 8d sketch travel engine
- Full co-benefits analysis
- Modular, expandable
  
- *Fully loaded with all major California MPO base data*
  
- [www.calthorpe.com](http://www.calthorpe.com) for model info

**True Open Source Platform**



# Open Source Software 'Stack'



## Display/Reporting

Highcharts

Open Layers



django



## Data Delivery & Queuing

Celery/Redis Queue

Geoserver



## Database, Analysis, UI

Postgresql/PostGIS

Python/Django/Apache



ubuntu

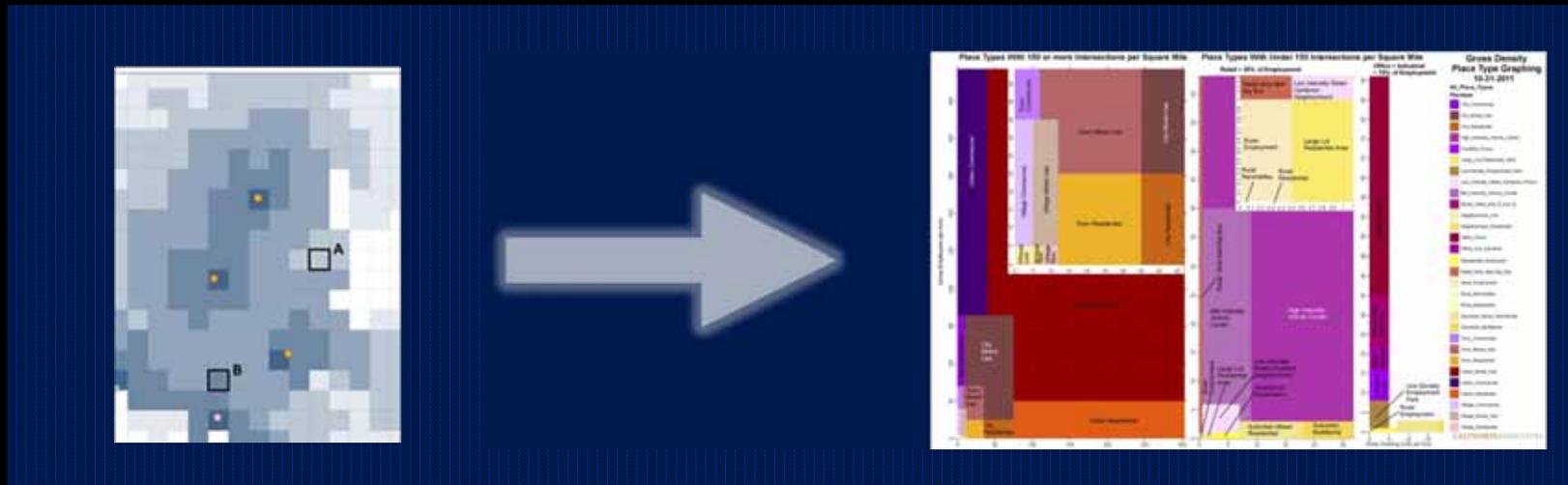
## Operating Environment

Ubuntu 11.10

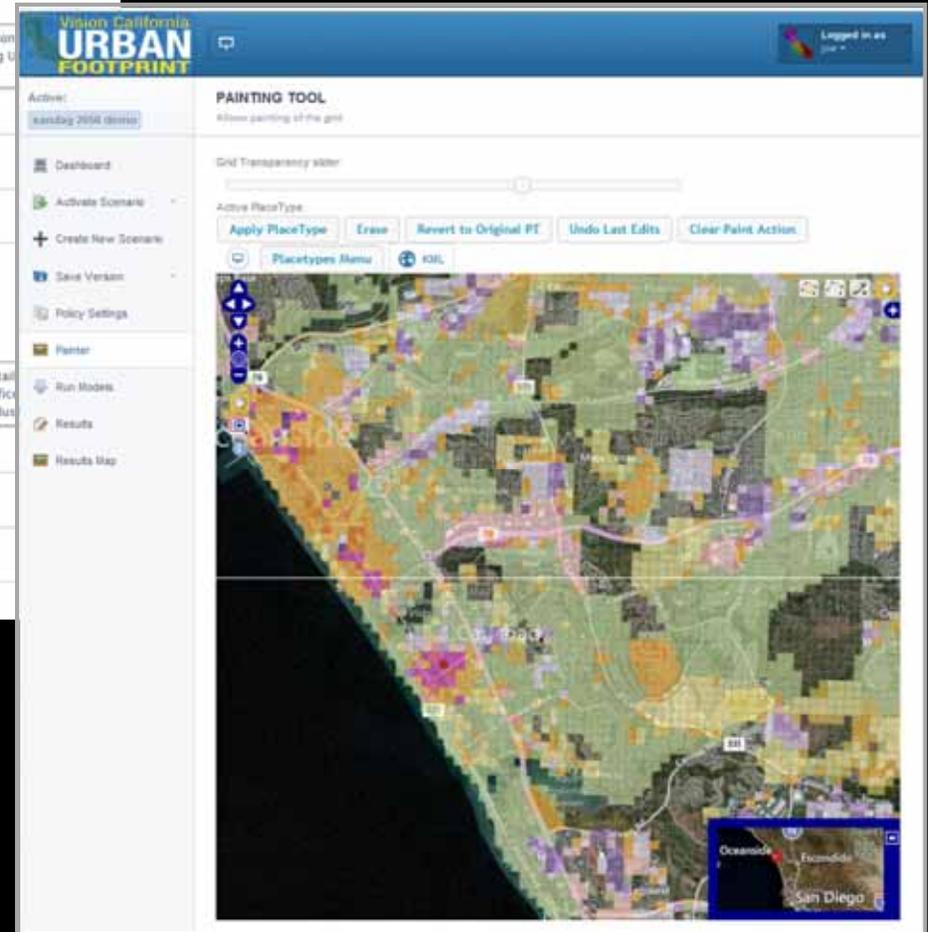
Linux

# Faster and More Efficient

Place Type Translation for 8- County San Joaquin Valley

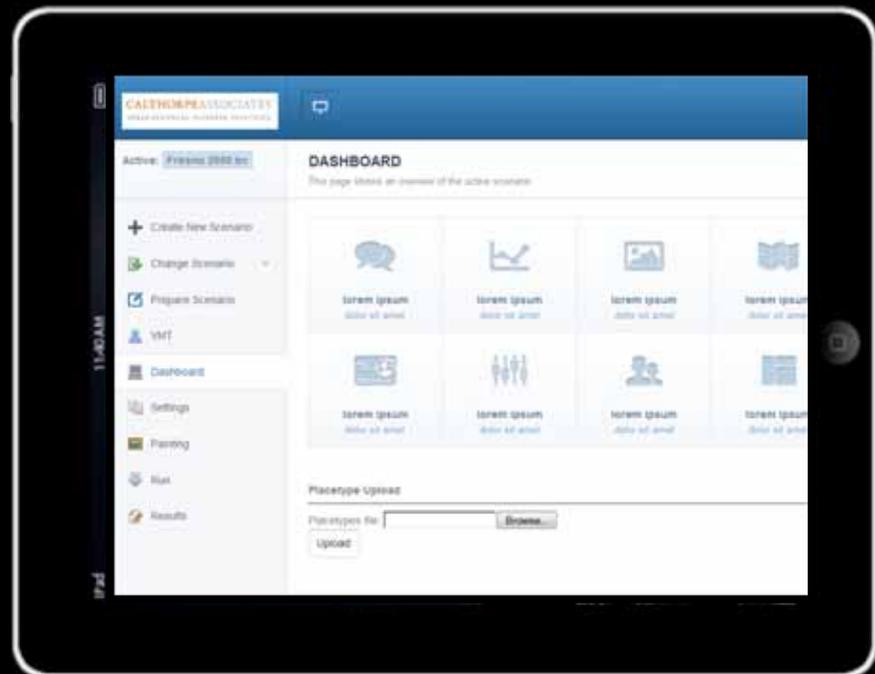
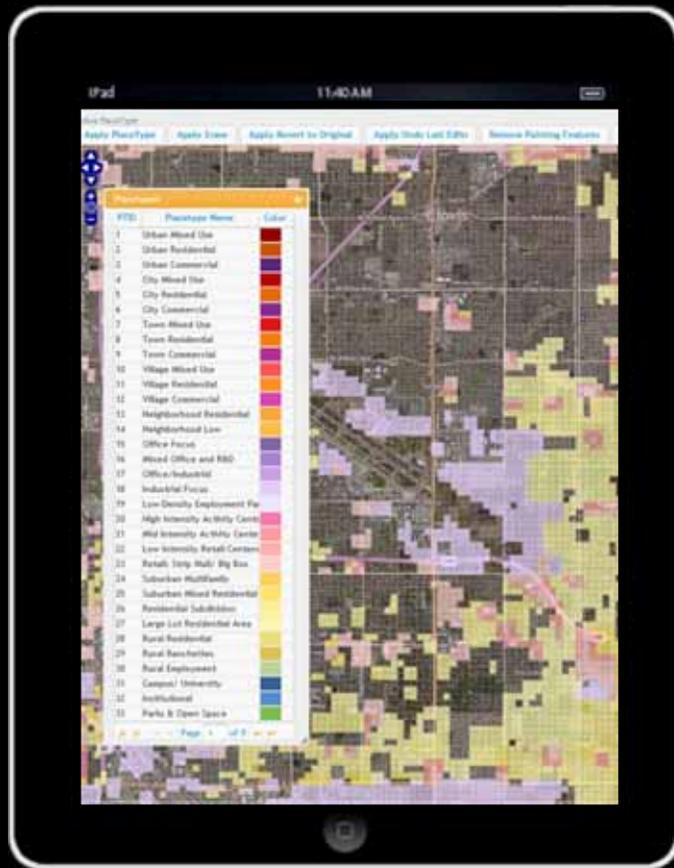


# 'Thin Client' User Interface

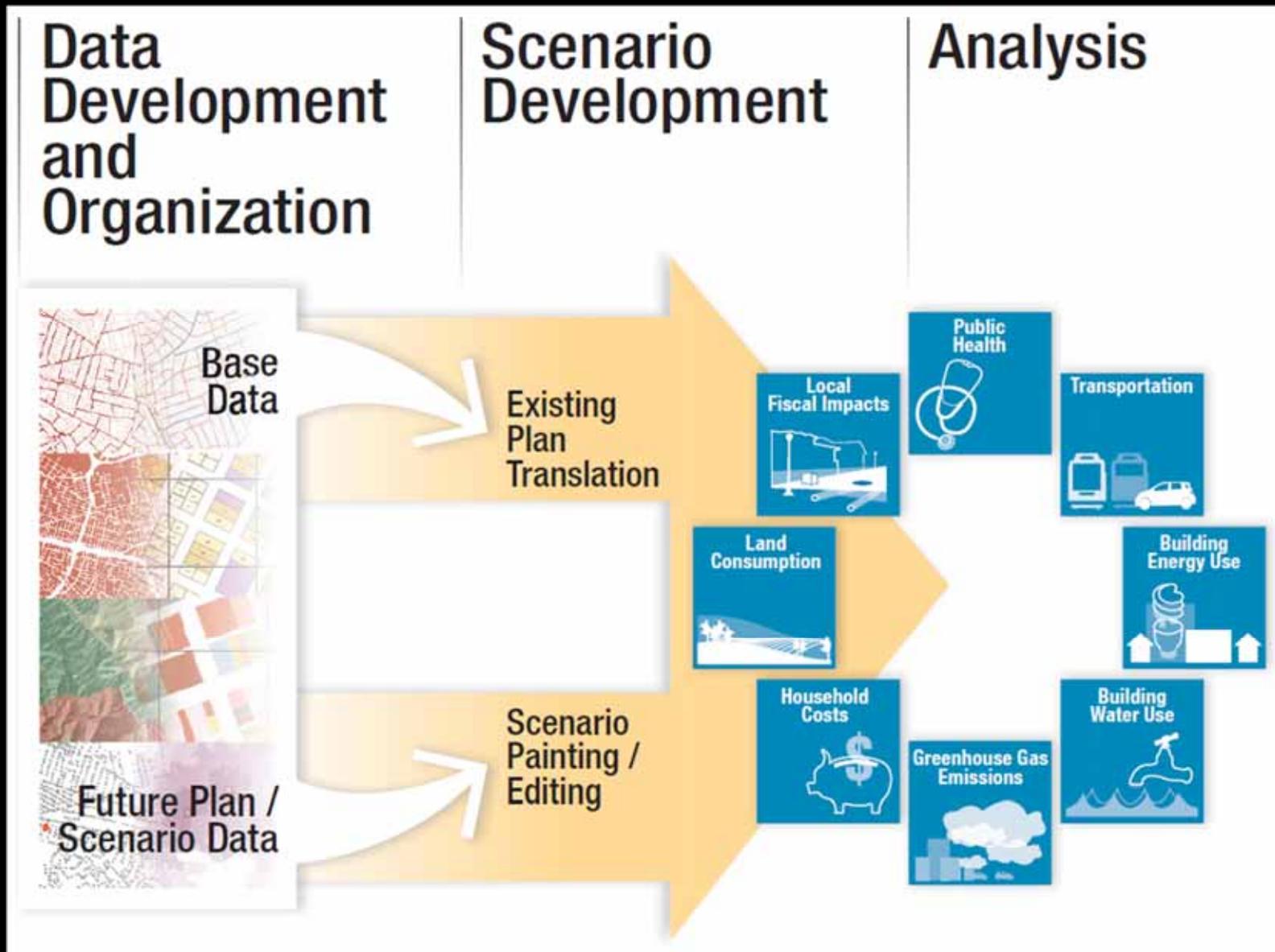


Web-Based Interface

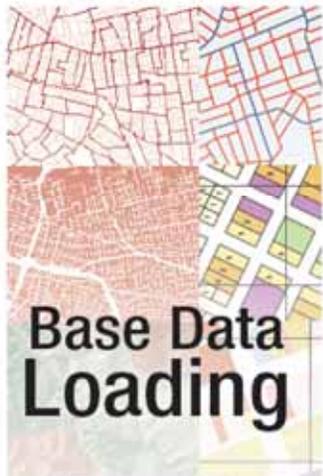
# Tablet and Mobile-Ready



# UrbanFootprint Model Components



# Base Data Development



150 meter Grid

Transportation  
*Intersection Density and Transit Proximity*

Census  
*Population and Jobs Characteristics*

Parcels  
*Housing, Jobs, and Land Uses*

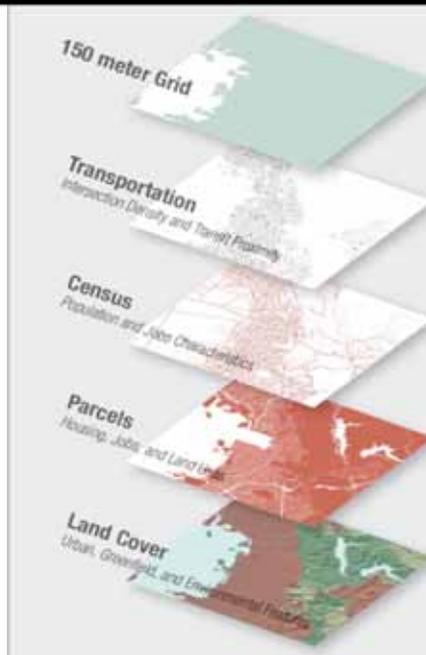
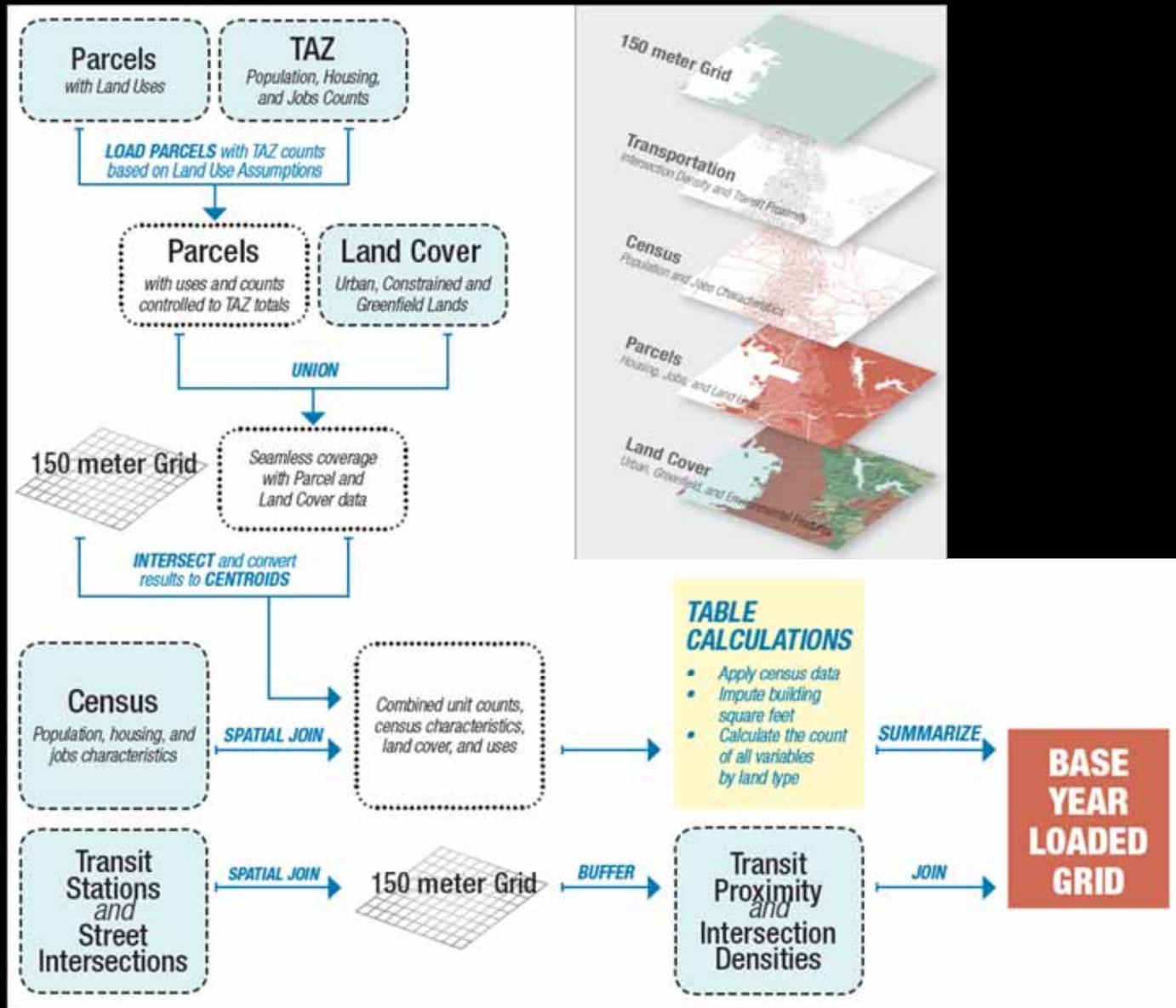
Land Cover  
*Urban, Greenfield, and Environmental Features*

Land Consumption  
Local Fiscal Impacts  
Transportation  
Building Energy Use  
Building Water Use

Analysis

Greenhouse Gas Emissions  
Public Health  
Household Costs

# Base Data Development



# Base Data Development



Parcel Data

Demographics and  
Control Totals (TAZ)

Distributed to  
Land Uses

Assigned to  
Parcels

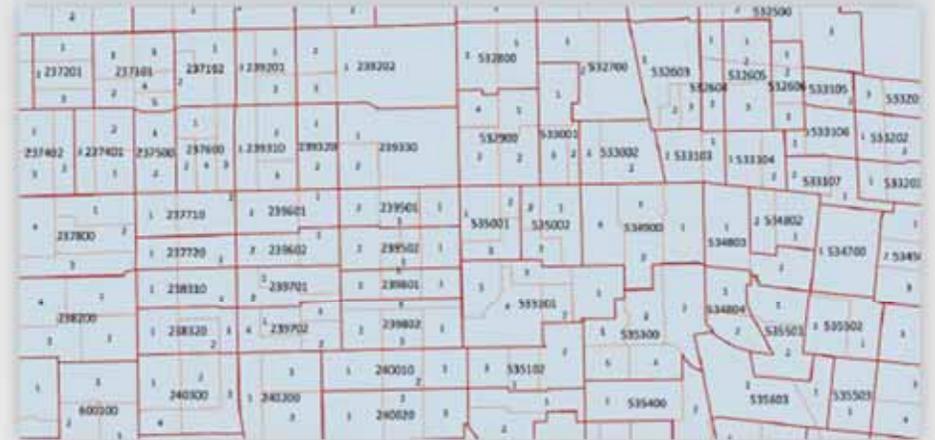


# Base Data Development

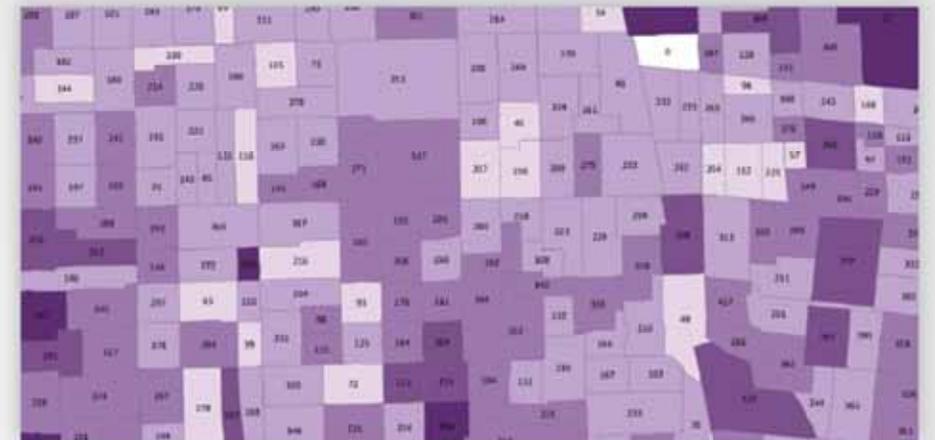


## Census and Related Data

Census  
Demographics



Block and Block  
Group Data  
Applied to Parcels  
and Grids



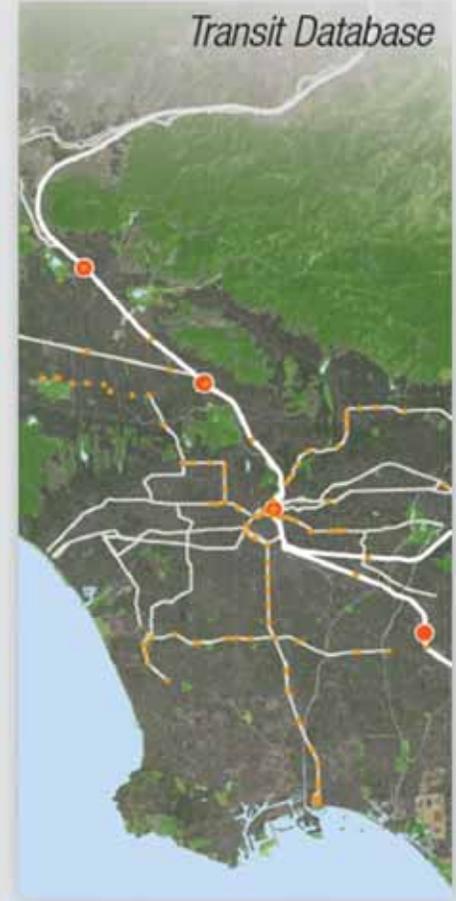
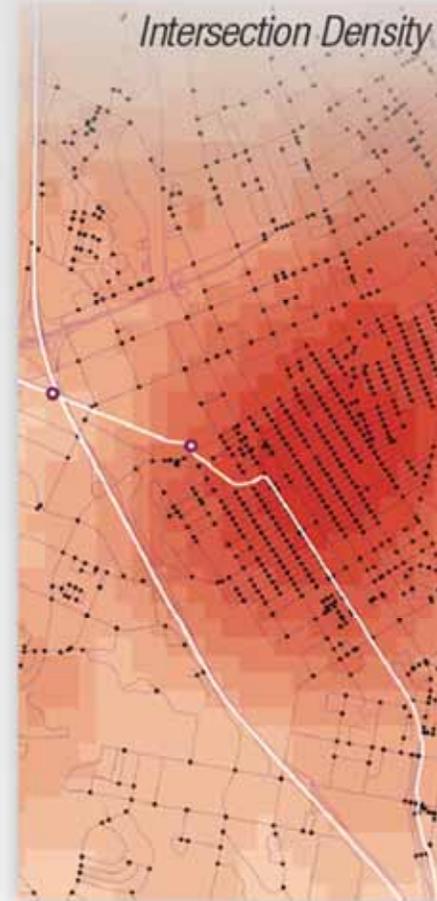
# Base Data Development



## Transportation Features

Transportation Features Database

Proximity and Connectivity Analysis



# Base Data Variables

## UrbanFootprint

### Base Year Grid Variables

Variable Name	Definition
ID_Grid	Grid ID
County	County Name
Placetype_ID	Placetype code
Placetype	Placetype name

#### Area Variables by Use and Landtype

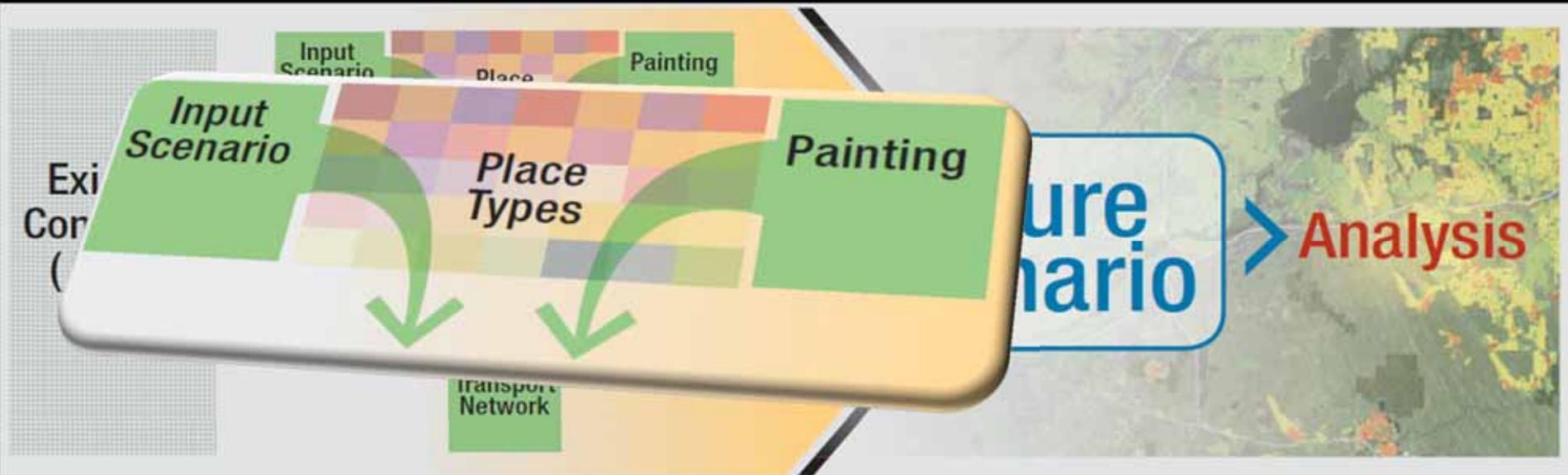
Parcel_SqFt	Parcel square feet
Acres_Grid	Grid cell acres (approx 5.55987)
Acres_Grid_Urban	Urban grid cell acres
Acres_Grid_GF	Greenfield grid field acres
Acres_Grid_Con	Constrained grid field acres ( <i>Note: These acres can be of farmland classes below, but it is anticipated that we will</i>
Acres_Grid_GF_FMMP_Prime_Farmland	Greenfield grid field acres on prime farmland
Acres_Grid_GF_FMMP_Imp_State_Farmland	Greenfield grid field acres on farmland of state importance
Acres_Grid_GF_FMMP_Imp_Local_Farmland	Greenfield grid field acres on farmland of local importance
Acres_Grid_GF_FMMP_Unique_Farmland	Greenfield grid field acres on unique farmland
Acres_Grid_GF_FMMP_Potential_Farmland	Greenfield grid field acres on potential farmland
Acres_Grid_GF_FMMP_Grazeland	Greenfield grid field acres on grazing land
Acres_Parcel	Parcel acres
Acres_Parcel_Urban	Urban parcel acres (defined by FMMP dataset)
Acres_Parcel_GF	Greenfield parcel Acres (defined by FMMP dataset)
Acres_Parcel_Con	Constrained parcel Acres (water bodies and protected lands)
Acres_Parcel_Res	Parcel acres with dwelling units <i>exclusively</i>
<i>The following four variables nest only into the Acres_Parcel_Res category (not Acres_Parcel_Mixed), but are</i>	
Acres_Parcel_Res_DetSF	Parcel acres with detached single family dwelling units
Acres_Parcel_Res_DetSF_SL	Parcel acres with small lot detached single family dwelling units
Acres_Parcel_Res_DetSF_LL	Parcel acres with large lot detached single family dwelling units
Acres_Parcel_Res_MF	Parcel acres with multi-family dwelling units (could have jobs)
Acres_Parcel_Emp	Parcel acres with jobs <i>exclusively</i>
<i>The following four variables nest only into the Acres_Parcel_Emp category (not Acres_Parcel_Mixed), but are</i>	
Acres_Parcel_Emp_Off	Parcel acres with office jobs (might include other job types)
Acres_Parcel_Emp_Ret	Parcel acres with retail jobs (might include other job types)
Acres_Parcel_Emp_Ind	Parcel acres with industrial jobs (might include other job types)
Acres_Parcel_Emp_Ag	Parcel acres with agricultural jobs (might include other job types)
Acres_Parcel_Emp_Mixed	Parcel acres with more than one job type
Acres_Parcel_Mixed	Parcel acres with <i>both</i> dwelling units and jobs
<i>The following four variables nest only into the Acres_Parcel_Mixed category (not Acres_Parcel_Res or Acres_Parcel_Emp)</i>	
Acres_Parcel_Mixed_w_Off	Parcel acres with dwelling units and retail and office jobs
Acres_Parcel_Mixed_no_Off	Parcel acres with dwelling units and retail jobs (might include other job types)
Acres_Parcel_No_Use	Parcel acres with <i>neither</i> dwelling units and jobs

#### Density Variables

Gross_DU_Dens	Dwelling units per grid cell acre
Gross_HH_Dens	Households per grid cell acre
Gross_Pop_Dens	Population per grid cell acre
Gross_Emp_Dens	Jobs per grid cell acre
Gross_Tot_Dens	Population plus jobs per grid cell acre
Pop_Gr1_Dens	Population plus jobs per grid cell acre

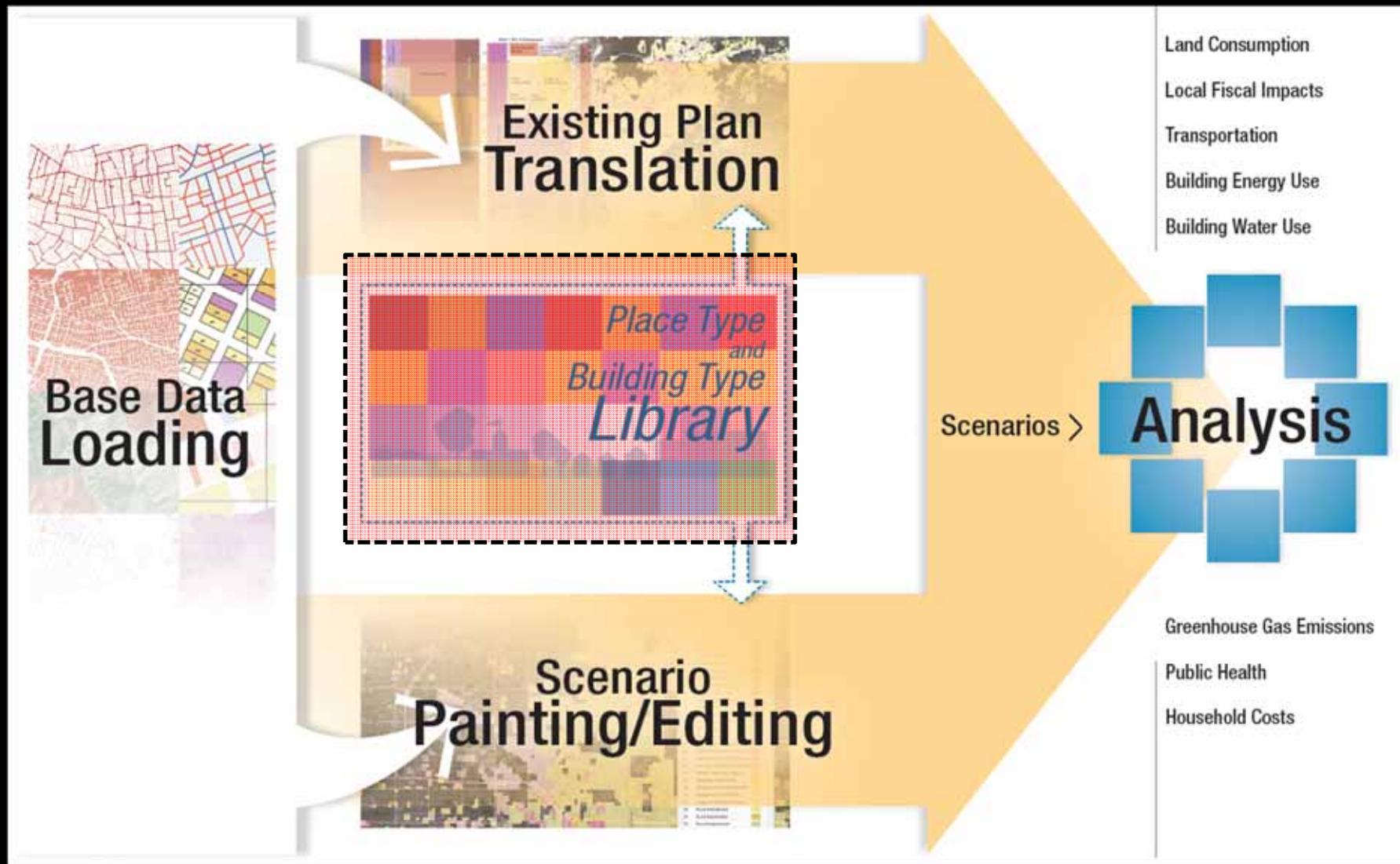
Emp_Industry_No_Ag	the VMT engine
Emp_Industry_No_Ag	The same as Emp_Industry except Emp_Ag and Emp_Extract are excluded.
<b>Building Square Footage Variables</b>	
Bldg_SqFt_DetSF	Sum of detached single family housing building square feet
Bldg_SqFt_DetSF_SL	Sum of small lot detached single family housing building square feet
Bldg_SqFt_DetSF_LL	Sum of large lot detached single family housing building square feet
Bldg_SqFt_AttSF	Sum of attached single family housing building square feet
Bldg_SqFt_MF2to4	Sum of 2-4 unit multifamily housing building square feet
Bldg_SqFt_MF5p	Sum of 5-plus unit multifamily housing building square feet
Bldg_SqFt_Retail	Sum of retail building square feet
Bldg_SqFt_RestAccom	Sum of restaurant, food service, and hotel building square feet
Bldg_SqFt_EntRec	Sum of arts, entertainment, and recreation building square feet
Bldg_SqFt_Office	Sum of office building square feet
Bldg_SqFt_Public	Sum of public building square feet
Bldg_SqFt_Ar	Sum of armed forces building square feet
Bldg_SqFt_Educ	Sum of education building square feet
Bldg_SqFt_MedSS	Sum of health care and social service building square feet
Bldg_SqFt_TransWare	Sum of transportation and warehousing building square feet
Bldg_SqFt_Whole	Sum of wholesale building square feet
Bldg_SqFt_Manuf	Sum of manufacturing building square feet
Bldg_SqFt_Util	Sum of utility building square feet
Bldg_SqFt_Constr	Sum of construction building square feet
Bldg_SqFt_Emp_Other	Sum of other (non-agricultural and extraction) building square feet (includes repair, laundry, funeral services, and nonprofit office buildings)
<b>Transit Proximity Variables</b>	
Tr_All_Grid	Number of transit stops of all types in the grid cell
Tr_All_QrtMi	Number of transit stops of all types within a 1/4 mile search radius
Tr_All_HalfMi	Number of transit stops of all types within a 1/2 mile search radius
Tr_All_ThreeQrtMi	Number of transit stops of all types within a 3/4 mile search radius
Tr_All_OneMi	Number of transit stops of all types within a one mile search radius
Tr_All_OneKm	Number of transit stops of all types within a one km search radius
Tr_HSR_Grid	Number of high speed rail stops in the grid cell
Tr_HSR_QrtMi	Number of high speed rail stops within a 1/4 mile search radius
Tr_HSR_HalfMi	Number of high speed rail stops within a 1/2 mile search radius
Tr_HSR_ThreeQrtMi	Number of high speed rail stops within a 3/4 mile search radius
Tr_HSR_OneMi	Number of high speed rail stops within a one mile search radius
Tr_HSR_OneKm	Number of high speed rail stops within a one km search radius
Tr_Ferry_Grid	Number of ferry stops in the grid cell
Tr_Ferry_QrtMi	Number of ferry stops within a 1/4 mile search radius
Tr_Ferry_HalfMi	Number of ferry stops within a 1/2 mile search radius
Tr_Ferry_ThreeQrtMi	Number of ferry stops within a 3/4 mile search radius
Tr_Ferry_OneMi	Number of ferry stops within a one mile search radius
Tr_Ferry_OneKm	Number of ferry stops within a one km search radius
Tr_Intercity_Grid	Number of intercity rail stops in the grid cell
Tr_Intercity_QrtMi	Number of intercity rail stops within a 1/4 mile search radius
Tr_Intercity_HalfMi	Number of intercity rail stops within a 1/2 mile search radius
Tr_Intercity_ThreeQrtMi	Number of intercity rail stops within a 3/4 mile search radius
Tr_Intercity_OneMi	Number of intercity rail stops within a one mile search radius
Tr_Intercity_OneKm	Number of intercity rail stops within a one km search radius
Tr_Commuter_Grid	Number of commuter rail stops in the grid cell

# From Base to Future....



# Place Types

## Scenario Building Blocks



# Place Types

Mixed Use Centers and Corridors	1	Urban Mixed Use	Suburban	20	High Intensity Activity Center		
	2	Urban Residential		21	Mid Intensity Activity Center		
	3	Urban Commercial		22	Low Intensity Retail Centered Neighborhood		
	4	City Mixed Use		23	Retail: Strip Mall / Big Box		
	5	City Residential		24	Industrial / Office / Residential Mixed High		
	6	City Commercial		25	Industrial / Office / Residential Mixed Low		
	7	Town Mixed Use		Suburban Residential	26	Suburban Multifamily	
	8	Town Residential			27	Suburban Mixed Residential	
	9	Town Commercial			28	Residential Subdivision	
	10	Village Mixed Use			29	Large Lot Residential Area	
	Employment Areas	11		Village Residential	Rural	30	Rural Residential
		12		Village Commercial		31	Rural Ranchettes
		13		Neighborhood Residential		32	Rural Employment
		14		Neighborhood Low	Institutional	33	Campus / University
15		Office Focus	34	Institutional			
16		Mixed Office and R&D		35	Parks and Open Space		
17		Office / Industrial					
18		Industrial Focus					
19		Low-Density Employment Park					

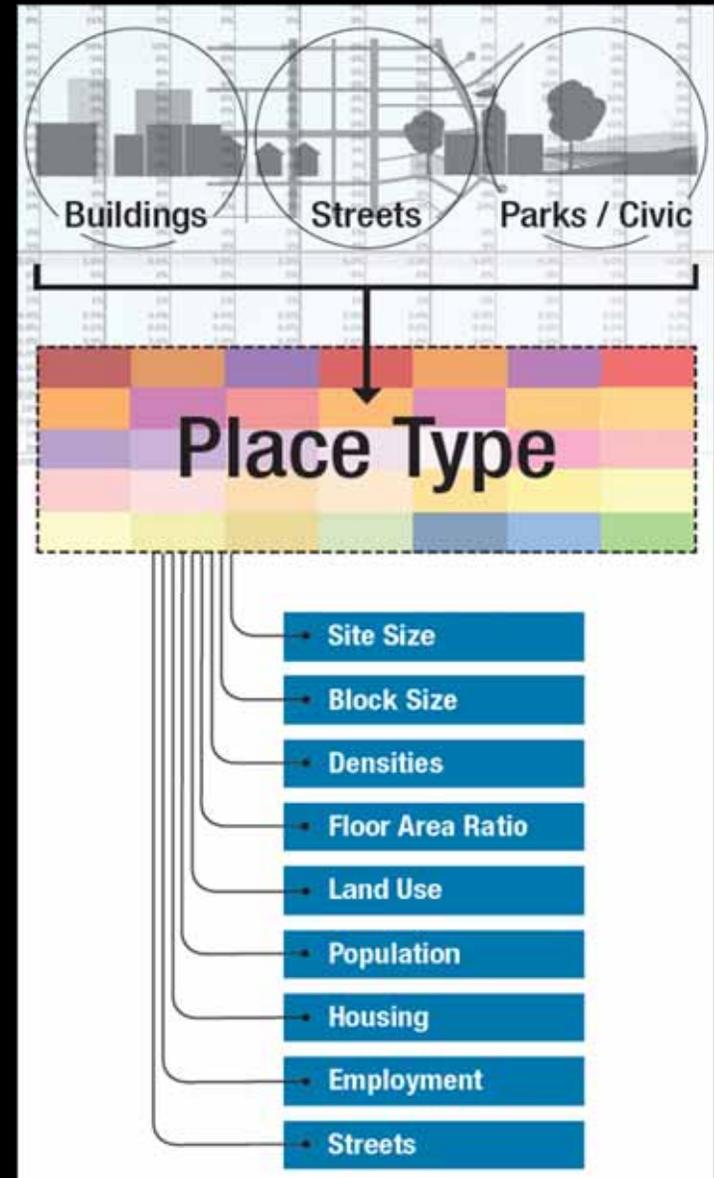
## Scenario Building Blocks

# Place and Building Type Studies

Place Type Studies



Building Type Studies



# Place Types

## Summary

Meta-Place Types →	Place Types with 150 or more Intersections per Square Mile														Employment Areas					Suburban		
	Mixed Use Centers & Corridors														Employment Areas					Suburban		
	Urban (Super Regional Center)			City (Regional Center)			Town (Subregional Center)			Village (Small Mixed-Use Center)			Neighborhood		Hi/Mid Intensity		Low Intensity			Commercial/Mixed Use		
Place Types →	Urban Mixed Use	Urban Residential	Urban Commercial	City Mixed Use	City Residential	City Commercial	Town Mixed Use	Town Residential	Town Commercial	Village Mixed Use	Village Residential	Village Commercial	Neighborhood Residential	Neighborhood of Low	Office Focus	Mixed Office and R&D	Office/Industrial	Industrial Focus	Low-Density Employment Park	High Intensity Activity Center	Mid Intensity Activity Center	Low Intensity Retail/Community Mixed Use
Place Type Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<b>Place Types Summary</b>																						
Gross Emp Density (Jobs/Acre)	254	32	390	44	15	145	50	7	64	15	2.1	39	3	2.0	51	33	21	14	8	53	10	3.2
Gross DU Density	92	116	16	43	48	9.4	24	20	7	11	11	2.4	8	4	-	-	-	-	-	37	7	4.1
Emp. Use Density (Jobs/Emp. Acre)	459	58	704	86	35	258	107	26	114	55	26	81	37	33	73	48	27	19	14	91	19	8
Res. Use Density (DU/Res. Acre)	215	229	168	101	93	142	65	35	54	27	20	35	15	8	0	0	0	0	0	81	29	11
<b>Land Use Breakdowns (%)</b>																						
Mixed Use	29%	8%	7%	22%	7%	3%	18%	7%	11%	10%	0%	5%	1%	0%	0%	0%	0%	0%	0%	31%	3%	0%
Residential	12%	40%	0%	18%	41%	0%	17%	49%	0%	29%	54%	0%	57%	58%	0%	0%	0%	0%	0%	10%	17%	36%
Employment	10%	3%	48%	11%	3%	52%	13%	0%	44%	10%	0%	41%	0%	0%	65%	70%	76%	75%	56%	28%	48%	26%
Streets	37%	37%	37%	36%	36%	36%	36%	28%	36%	32%	27%	32%	25%	25%	21%	21%	17%	16%	35%	25%	25%	20%
Parks	7%	7%	7%	7%	7%	7%	7%	7%	7%	10%	10%	15%	10%	10%	4%	4%	4%	4%	4%	4%	4%	4%
Civic	6%	6%	2%	6%	6%	2%	9%	9%	2%	9%	9%	7%	7%	7%	10%	5%	3%	5%	5%	2%	2%	14%
<b>Land Use Summary</b>																						
Gross Residential Density (DU/Acre)	92	116	16	43	48	9	24	20	7	11	11	2	8	4	-	-	-	-	-	37	7	4
Net Residential Density (DU/Acre)	166	209	28	77	85	17	43	30	12	20	18	5	13	7	-	-	-	-	-	53	10	5
Gross Jobs Density (Employees/Acre)	254	32	390	44	15	145	50	7	64	15	2	39	3	2	51	33	21	14	8	53	10	3
Net Jobs Density (Employees/Acre)	459	58	704	78	27	258	89	11	114	27	3	81	4	3	73	48	27	19	14	77	14	4
Gross Total Density (Population+Jobs/Acre)	406	216	417	120	100	161	94	46	76	38	27	43	23	14	51	33	21	14	8	120	24	13
Gross FAR	5.0	3.5	3.3	1.7	1.5	1.5	1.1	0.8	1.0	0.6	0.5	0.6	0.4	0.4	0.7	0.5	0.4	0.4	0.2	1.7	0.9	0.3
Net FAR	9.0	6.4	6.0	3.1	2.6	2.7	1.9	1.2	1.8	1.0	0.9	1.2	0.7	0.6	1.1	0.8	0.5	0.5	0.4	2.5	1.3	0.4
Average Building Height	12	9.1	8.2	3.4	3	3	2.1	1.9	1.6	1.4	1.5	1.0	1.3	1.5	2.4	1.7	1.1	0.9	0.6	3.2	1.8	1.2
<b>Housing Breakdown</b>																						
Single Family	0%	0%	0%	0%	0%	0%	0%	0%	0%	16%	32%	0%	94%	100%	0%	0%	0%	0%	0%	0%	0%	68%
Single Family Use Density (DU/Acre)	0	0	0	0	0	0	0	0	0	12	15	0	14	8	0	0	0	0	0	0	0	8
Townhome	0%	0%	0%	3%	6%	0%	10%	47%	0%	33%	68%	0%	0%	0%	0%	0%	0%	0%	0%	4%	47%	12%

EXPORT TO GIS-Building Type\_Atlas csv\_export PLACE\_TYPE\_TRANSLATE Place Type SUMMARY Place Type SUMMARY-PC Place Type Building Type Scenario Summary Variables

# Place Types

## Details

Meta-Place Types *	Mixed Use Centers & Corridors														Employment Areas			
	Urban (Super Regional Center)			City (Regional Center)			Town (Subregional Center)			Village (Small Mixed-Use Center)			Neighborhood		Hi/Mid Intensity		Low Intensity	
Place Types ®	Urban Mixed Use	Urban Residential	Urban Commercial	City Mixed Use	City Residential	City Commercial	Town Mixed Use	Town Residential	Town Commercial	Village Mixed Use	Village Residential	Village Commercial	Neighborhood Residential	Neighborhood Low	Office Focus	Mixed Office and R&D	Office/Industrial	Industrial Focus
Building Types ~	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Calibrated to Study Areas?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BUILDING % CHECK	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<b>MIXED USE</b>	57.0%	15.0%	12.0%	44.0%	14.0%	5.0%	38.0%	12.5%	20.0%	20.0%	0.0%	10.0%	2.0%	0.0%	0.0%	0.0%	0.0%	
1 Skyscraper Mixed Use	7%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
2 High-Rise Mixed Use	15%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
3 Mid-Rise Mixed Use	17%	3%	2%	10%	2%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
4 Low-Rise Mixed Use	12%	3%	3%	9%	4%	1%	10%	0%	2%	0%	0%	0%	0%	0%	0%	0%	0%	
5 Parking Structure/Mixed Use	0%	2%	0%	5%	1%	1%	5%	0%	3%	0%	0%	0%	0%	0%	0%	0%	0%	
6 Main Street Commercial/MU High (3-5 Floors)	3%	5%	5%	15%	5%	1%	13%	0%	5%	5%	0%	0%	0%	0%	0%	0%	0%	
7 Main Street Commercial/MU Low (1-2 Floors)	3%	0%	0%	5%	2%	1%	10%	13%	10%	15%	0%	10%	2%	0%	0%	0%	0%	
<b>RESIDENTIAL</b>	23.0%	80.0%	0.0%	35.0%	81.0%	0.0%	35.0%	87.5%	0.0%	60.0%	100.0%	0.0%	98.0%	100.0%	0.0%	0.0%	0.0%	
8 Skyscraper Residential	5%	12%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
9 High-Rise Residential	7%	15%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
10 Urban Mid-Rise Residential	8%	34%	0%	10%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
11 Urban Podium Multi-Family	3%	14%	0%	10%	26%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
12 Standard Podium Multi-Family	0%	5%	0%	5%	10%	0%	5%	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
13 Suburban Multifamily Apt/Condo	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
14 Urban Townhome/Live-Work	0%	0%	0%	10%	20%	0%	20%	45%	0%	30%	55%	0%	0%	0%	0%	0%	0%	
15 Standard Townhome	0%	0%	0%	0%	5%	0%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
16 Garden Apartment	0%	0%	0%	0%	0%	0%	0%	13%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
17 Very Small Lot 3000	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	35%	0%	68%	0%	0%	0%	0%	
18 Small Lot 4000	0%	0%	0%	0%	0%	0%	0%	0%	0%	20%	10%	0%	25%	30%	0%	0%	0%	
19 Medium Lot 5500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	20%	0%	0%	0%	
20 Large Lot 7500	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	
21 Estate Lot	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
22 Rural Residential	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
23 Rural Ranchette	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
<b>COMMERCIAL/INDUSTRIAL</b>	20.0%	5.0%	88.0%	21.0%	5.0%	95.0%	27.0%	0.0%	80.0%	20.0%	0.0%	90.0%	0.0%	0.0%	100.0%	100.0%	100.0%	
24 Skyscraper Office	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
25 High-Rise Office	5%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
26 Mid-Rise Office	0%	0%	13%	2%	0%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
27 Low-Rise Office	0%	0%	39%	3%	0%	42%	19%	0%	15%	0%	0%	0%	0%	0%	0%	0%	0%	
28 Main Street Commercial (Retail + Office/Medical)	5%	0%	8%	5%	0%	31%	5%	0%	50%	15%	0%	80%	0%	0%	0%	0%	0%	
29 Parking Structure+Ground-Floor Retail	5%	0%	5%	3%	0%	5%	0%	0%	5%	0%	0%	0%	0%	0%	0%	0%	0%	
30 Parking Structure	0%	0%	0%	3%	0%	0%	0%	0%	5%	0%	0%	0%	0%	0%	5%	5%	0%	
31 Office Park High	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	31%	5%	
32 Office Park Low	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	33%	20%	

# Building Types

All development stats are "net" unless otherwise specified.  
Dummy numbers in pink are used for formula development only and are not based on any research or actual buildings.

		BUILDING SUMMARY (PER ACRE)															Par
Building Types ↓		% within the mix	Assumed Acres	Height (Floors)	Residential %	Retail %	Office %	Industrial %	Total %	Total FAR	Total BUA (gross SF)	Total BUA (net, lease SF)	DU / Acre	Employees / Acre	Parking (Stalls/Acre)	Structured Parking (SF/Acre)	Par pe Sq
				input	input	input	input	input	Checksum	input	derived	derived	derived	derived	input		
	Mid-Rise Mixed (937 Glisan, Portland)	20%	1	16	94%	6%	0%	0%	100%	9.1	394,654	335,456	248.2	43.8	248.3	81,935.7	
	Mid-Rise Mixed (The Edge, Portland)	40%	1	11	57%	12%	31%	0%	100%	7.1	308,277	262,036	135.9	326.0	223.3	73,672.5	
	Mid-Rise Mixed (The Gregory Lofts, Portland)	40%	1	12	84%	6%	10%	0%	100%	7.4	321,473	273,252	158.5	124.4	223.2	73,669.2	
	<b>Mid-Rise Mixed Use</b>	<b>100%</b>	<b>1</b>	<b>12</b>	<b>75%</b>	<b>9%</b>	<b>16%</b>	<b>0%</b>	<b>100%</b>	<b>7.6</b>	<b>330,831</b>	<b>281,206</b>	<b>167.4</b>	<b>188.9</b>	<b>228</b>	<b>75,324</b>	
4	Low-Rise Mixed (SCAG Dist. Center MU)	0%	1	8	75%	25%	0%	0%	100%	2.0	87,120	74,052	52.3	39.0	70.8	23,359.1	
	Mid-Rise Mixed (Museum Place, Portland OR)	36%	1	8	70%	30%	0%	0%	100%	5.0	217,800	174,676	153.1	98.6	239.1	78,903.0	
PK	Mid-Rise Mixed (Gala Bldg, Berkeley)	2%	1	7	87%	13%	0%	0%	100%	5.7	248,292	211,048	292.8	57.8	138.8	45,787.5	
	Mid-Rise Mixed (Fine Arts, Berkeley)	2%	1	8	90%	10%	0%	0%	100%	3.0	131,116	111,448	167.7	22.8	107.5	35,484.9	
	Mid-Rise Mixed (East End Gateway, Sacramento)	2%	1	8	93%	7%	0%	0%	100%	2.9	126,324	107,375	140.2	15.4	171.9	56,740.2	
GGLO	Mid-Rise Mixed (Site 17, Seattle)	2%	1	7	98%	2%	0%	0%	100%	4.6	200,812	170,690	193.7	8.6	197.8	65,272.2	
GGLO	Mid-Rise Mixed (Alcyone, Seattle)	2%	1	7	99%	1%	0%	0%	100%	4.1	180,338	153,288	193.4	3.5	196.4	64,808.7	
HM	Mid-Rise Mixed (1885 University/New Californian, Berkeley)	2%	1	5	90%	10%	0%	0%	100%	3.2	139,392	118,483	149.8	21.5	154.0	50,820.0	
PK	Mid-Rise Mixed (Touriel Bldg, Berkeley)	2%	1	5	94%	6%	0%	0%	100%	3.4	149,846	127,369	199.1	16.6	45.6	15,031.5	
	Low-Rise Mixed (Cap Metro City Center MU)	0%	1	4	40%	20%	40%	0%	100%	3.0	130,680	111,078	47.5	194.9	114.2	37,675.0	
	Low-Rise Mixed (Stone Way Apts, Seattle)	20%	1	4	90%	10%	0%	0%	100%	2.4	105,851	89,973	97.9	18.4	154.9	51,126.9	
	Low-Rise Mixed (200 Second Street, Oakland)	5%	1	6	89%	11%	0%	0%	100%	3.8	163,350	138,848	161.0	31.3	178.0	58,740.0	
	Low-Rise Mixed (Cabrini First Hill Apts, Seattle)	5%	1	6	85%	15%	0%	0%	100%	3.5	152,896	129,961	160.9	39.9	109.7	36,194.4	
	Low-Rise Mixed (Kinsey Flats, Cincinnati, OH)	15%	1	4	76%	24%	0%	0%	100%	1.2	50,679	43,425	30.1	22.8	131.8	43,482.7	
	Low-Rise Mixed (Shattuck Lofts, Berkeley)	5%	1	4	90%	10%	0%	0%	100%	4.0	174,240	148,104	177.7	31.2	240.7	79,420.8	
	<b>Low-Rise Mixed Use</b>	<b>100%</b>	<b>1</b>	<b>6</b>	<b>81%</b>	<b>19%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>	<b>3.6</b>	<b>155,227</b>	<b>128,231</b>	<b>131.0</b>	<b>50.6</b>	<b>183</b>	<b>60,550</b>	
5	Parking Structure/Mixed Use (Fahrenheit Condos + Petco Park)	40%	1	4	50%	50%	0%	0%	100%	0.8	34,848	29,621	12.3	14.8	396.0	130,680.0	
	Parking Structure/Mixed Use (2)	35%	1	5	50%	50%	0%	0%	100%	1.6	69,696	59,242	19.7	29.6	528.0	174,240.0	
	Parking Structure/Mixed Use (3)	25%	1	6	50%	50%	0%	0%	100%	2.4	104,544	88,862	24.7	44.4	660.0	217,800.0	
	<b>Parking Structure/Mixed Use</b>	<b>100%</b>	<b>1</b>	<b>5.1</b>	<b>50%</b>	<b>50%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>	<b>1.7</b>	<b>73,181</b>	<b>62,204</b>	<b>19.5</b>	<b>31.1</b>	<b>541.2</b>	<b>178,596.0</b>	
6	Main Street Commercial/MU (SACOG 19. MU Res Focus)	0%	1	3	70%	25%	5%	0%	100%	1.4	59,242	50,355	46.1	32.4	61.2	20,190.5	
	Main Street Commercial/MU (SACOG 18. MU Emp Focus)	0%	1	3	45%	40%	15%	0%	100%	1.1	47,045	39,988	23.5	50.8	45.5	15,020.2	
	Main Street Commercial/MU (SACOG 43. Natomas MU)	0%	1	3	70%	25%	5%	0%	100%	0.5	23,087	19,624	11.5	13.1	17.4	5,752.1	
	Main Street Commercial/MU (3400 Cesar Chavez St, SF, CA)	10%	1	4	81%	19%	0%	0%	100%	2.8	123,275	107,594	84.9	50.5	130.9	43,180.5	
	Main Street Commercial/MU (Belmont Dairy, Portland OR)	20%	1	5	78%	22%	0%	0%	100%	2.2	119,790	97,389	102.6	54.5	56.0	16,400.0	
	Main Street Commercial/MU (Venice Renaissance, Venice CA)	10%	1	4	77%	23%	0%	0%	100%	1.9	82,764	77,740	55.6	39.0	295.0	97,350.0	
	Main Street Commercial/MU (International Place, Harrisburg PA)	40%	1	3	69%	31%	0%	0%	100%	2.9	126,324	89,715	135.5	87.0	174.7	57,649.8	
	Main Street Commercial/MU (Hellig-Levine, Raleigh NC)	20%	1	3	0%	48%	52%	0%	100%	2.4	104,544	75,580	0.0	225.9	75.6	24,941.3	
	Main Street Commercial/MU (SCAG Lifestyle Main Street)	0%	1	4	40%	60%	0%	0%	100%	0.8	32,670	28,750	10.5	37.1	28.1	9,271.7	

EXPORT TO DB-BldgType\_Attr csv export PLACE TYPE TRANSLATE Place Type SUMMARY Place Type SUMMARY-PC Place Type Building Type Scenario Summary Variables

# Climate/Location Sensitivity

## LOCATION-DEPENDENT VARIABLES

### WATER USE VARIABLES

Indoor	
Per-capita single family gallons per day:	80 gal
Per-capita multifamily gallons per day:	70 gal

Outdoor	
Evapotranspiration Zone:	1
Active ETo factor:	32.9
ET factor:	1.0
Gallons per AF:	325,851 gal/af

### CIMIS Average Reference Evapotranspiration

Zone	Annual ETo
1	32.9
2	39.0
3	46.3
4	46.6
5	43.9
6	49.7
7	43.3
8	49.4
9	55.1
10	49.1
11	53.1
12	53.4
13	54.3
14	57.0
15	57.9
16	62.5
17	66.5
18	71.6

### ENERGY USE VARIABLES

Title 24 Climate Zone (Residential):	5 (T24)	<i>Need to group sf types into categories.</i>
CEC Forecasting Climate Zone (Commercial):	3 (FCZ)	<i>Name each energy use/energy intensity variable.</i>

### Residential Electricity and Gas Use by Unit Type - ACTIVE FACTORS

	Single family 3000+ sf	Single family 2501-3000 sf	Single family 2001-2500 sf	Single family 1501-2000 sf	Single family 1251-1500 sf	Townhouse Average	Apt/Condo
Electricity	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
Gas	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm

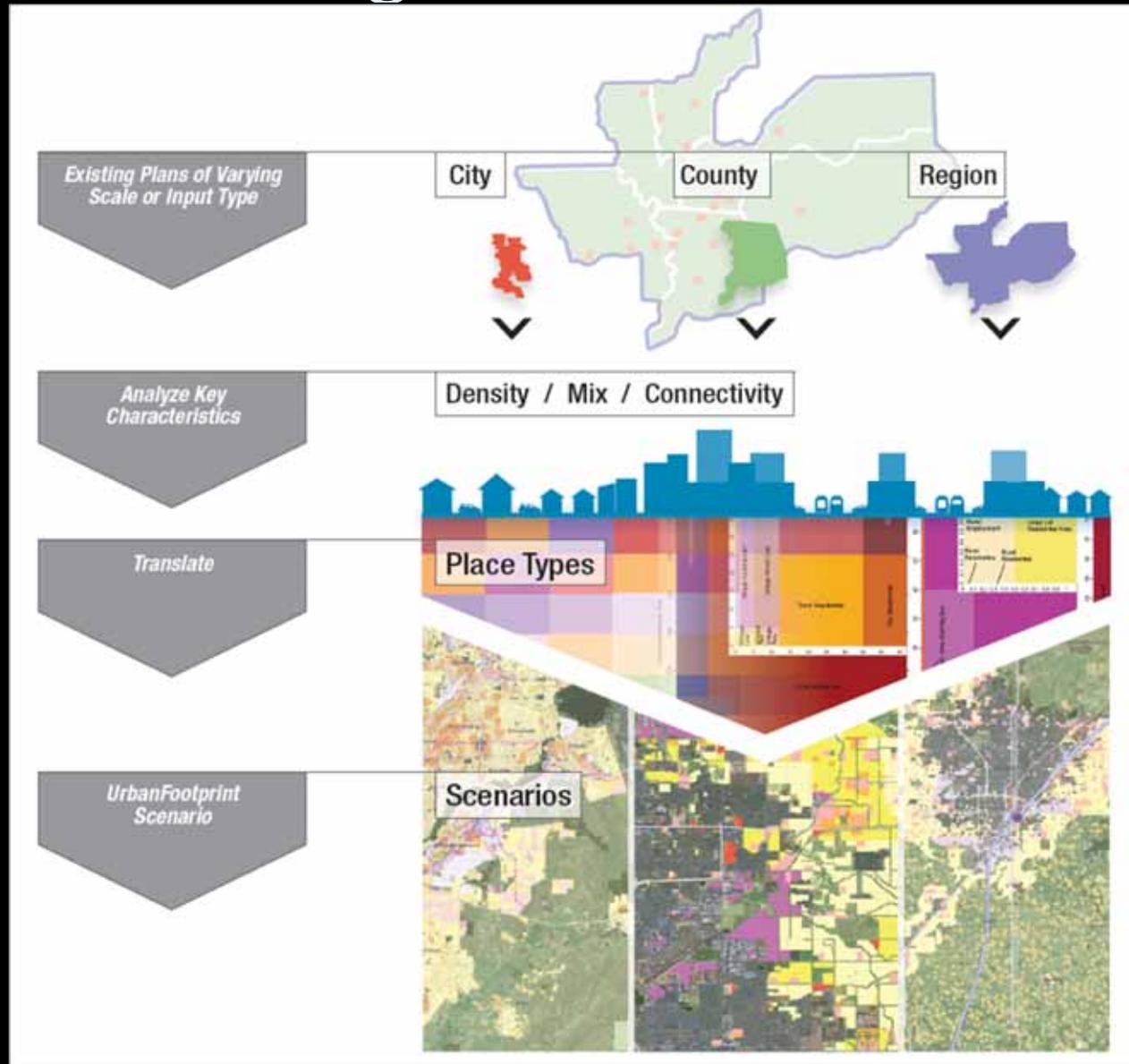
### Residential Electricity Use by Zone and Unit Type - LOOKUP TABLE

Title 24 Climate Zone	Single family 3000+ sf	Single family 2501-3000 sf	Single family 2001-2500 sf	Single family 1501-2000 sf	Single family 1251-1500 sf	Townhouse Average	Apt/Condo
1	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
2	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
3	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
4	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
5	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
6	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
7	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
8	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
9	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
10	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
11	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
12	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
13	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
14	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
15	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh
16	12,252 kWh	9,155 kWh	8,292 kWh	7,257 kWh	6,382 kWh	4,745 kWh	3,930 kWh

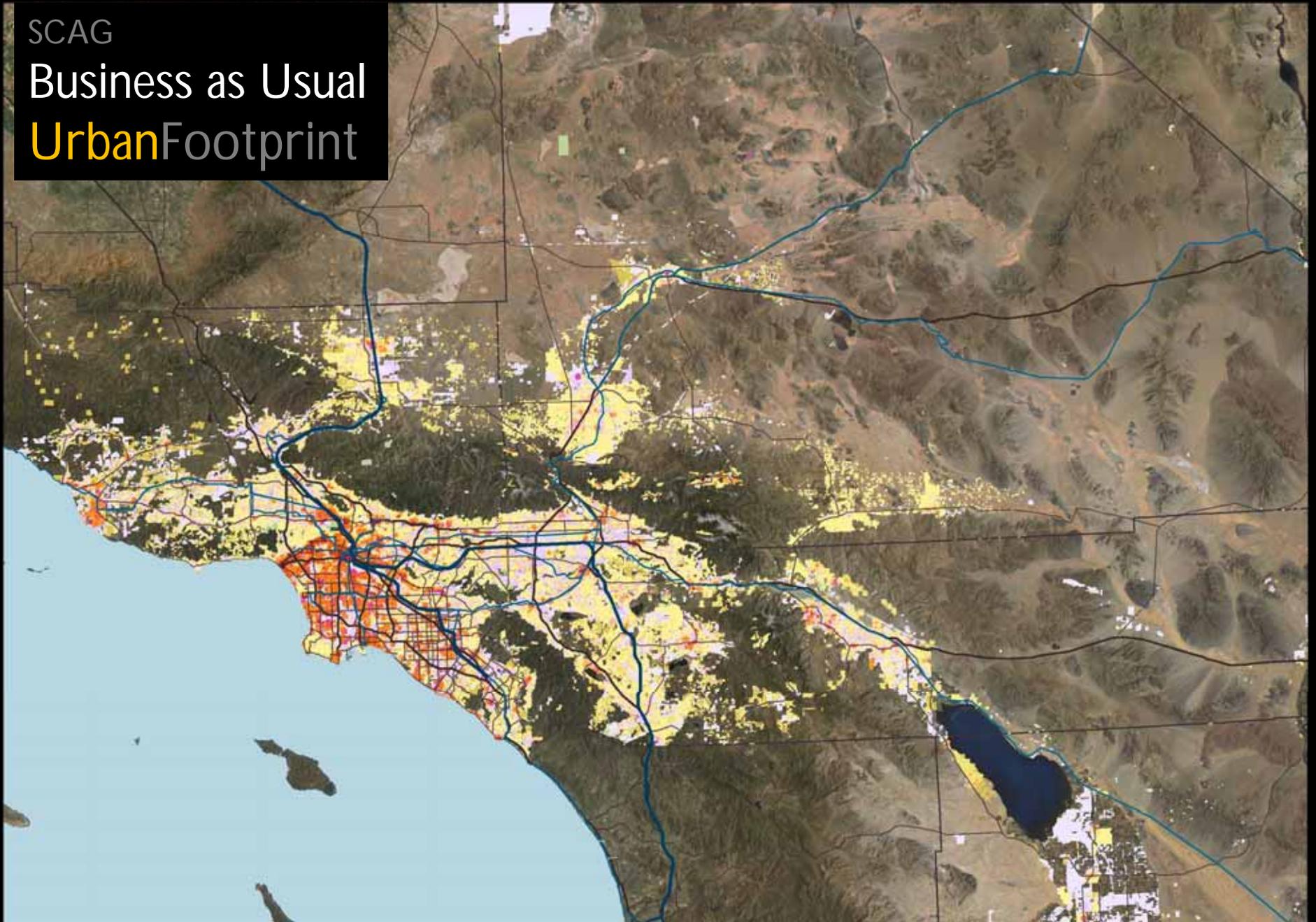
### Residential Gas Use by Zone and Unit Type - LOOKUP TABLE

Title 24 Climate Zone	Single family 3000+ sf	Single family 2501-3000 sf	Single family 2001-2500 sf	Single family 1501-2000 sf	Single family 1251-1500 sf	Townhouse Average	Apt/Condo
1	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm
2	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm
3	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm
4	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm
5	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm
6	893 thm	654 thm	603 thm	516 thm	505 thm	378 thm	215 thm

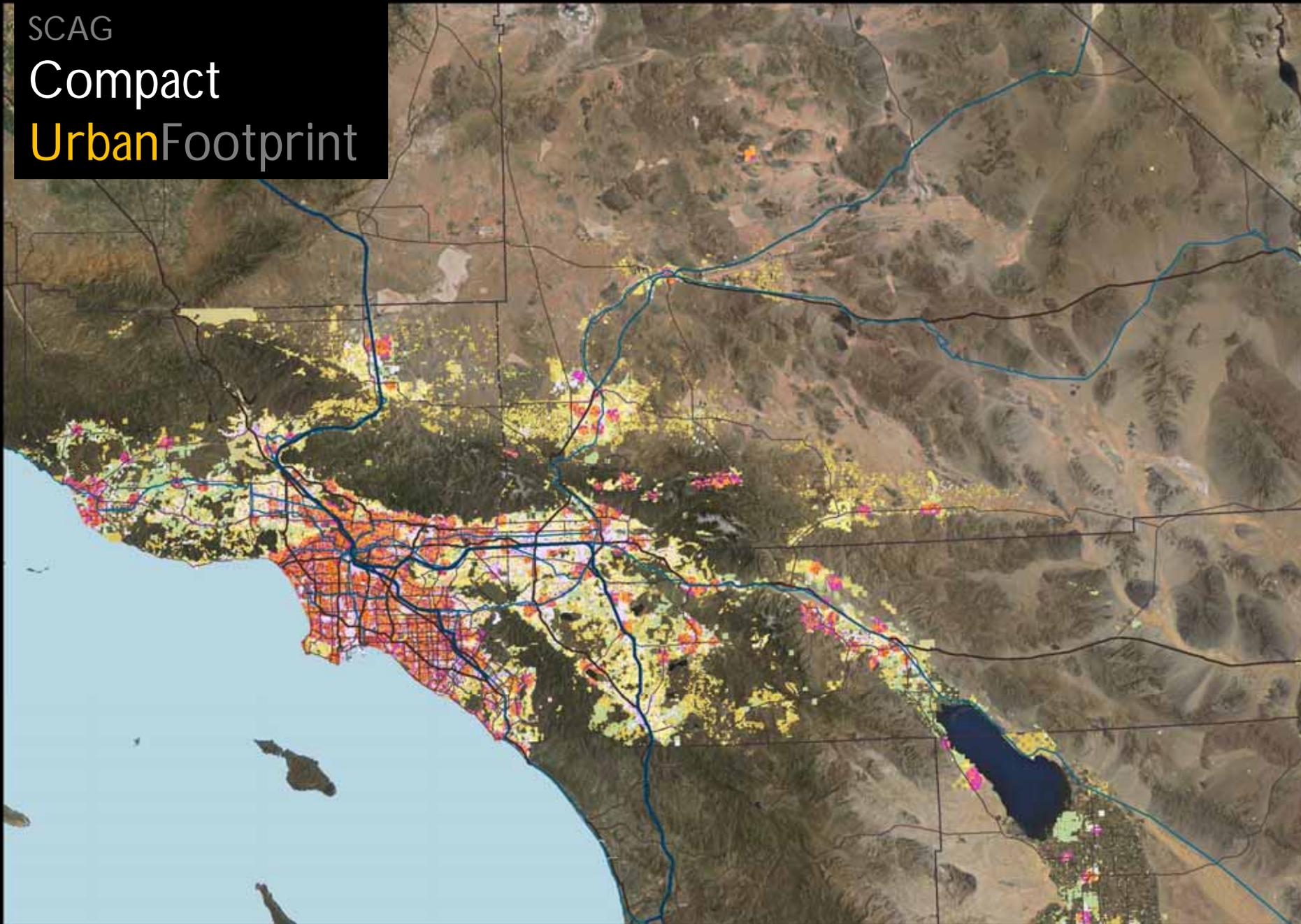
# Existing Plan Translation



SCAG  
Business as Usual  
UrbanFootprint



SCAG  
Compact  
UrbanFootprint



# Scenario Painter

## Edit Scenarios + Build New Ones

Placetypes

PTID	Placetype Name	Color
1	Urban Mixed Use	Dark Red
2	Urban Residential	Red
3	Urban Commercial	Dark Purple
4	City Mixed Use	Red
5	City Residential	Red
6	City Commercial	Dark Purple
7	Town Mixed Use	Red
8	Town Residential	Red
9	Town Commercial	Dark Purple
10	Village Mixed Use	Red
11	Village Residential	Red
12	Village Commercial	Dark Purple
13	Neighborhood Residential	Orange
14	Neighborhood Low	Orange
15	Office Focus	Purple
16	Mixed Office and R&D	Purple
17	Office/Industrial	Purple
18	Industrial Focus	Purple
19	Low-Density Employment Park	Purple
20	High Intensity Activity Center	Pink
21	Mid Intensity Activity Center	Pink
22	Low Intensity Retail-Centered	Pink
23	Retail: Strip Mall/ Big Box	Pink
24	Industrial/Office/Res Mixed H	Orange
25	Industrial/Office/Res Mixed L	Orange
26	Suburban Multifamily	Orange
27	Suburban Mixed Residential	Orange
28	Residential Subdivision	Yellow
29	Large Lot Residential Area	Yellow
30	Rural Residential	Yellow
31	Rural Ranchettes	Yellow
32	Rural Employment	Yellow
33	Campus/ University	Blue
34	Institutional	Blue
35	Parks & Open Space	Green

# Scenario Painting

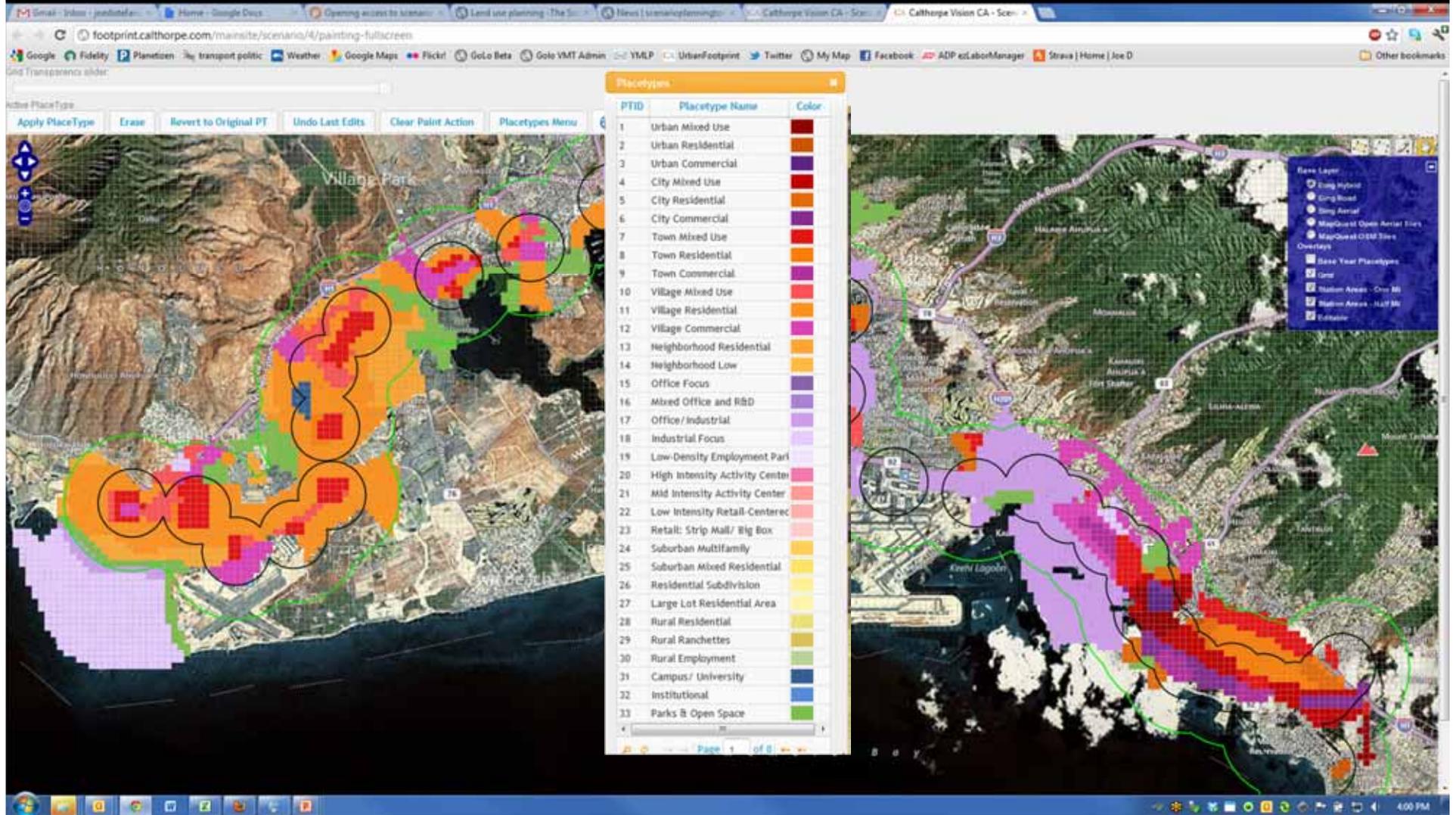
Active PlaceType: Apply PlaceType Apply Erase Apply Revert to Original Apply Undo Last Edits Remove Painting Features Show Placetypes KML

Placetypes

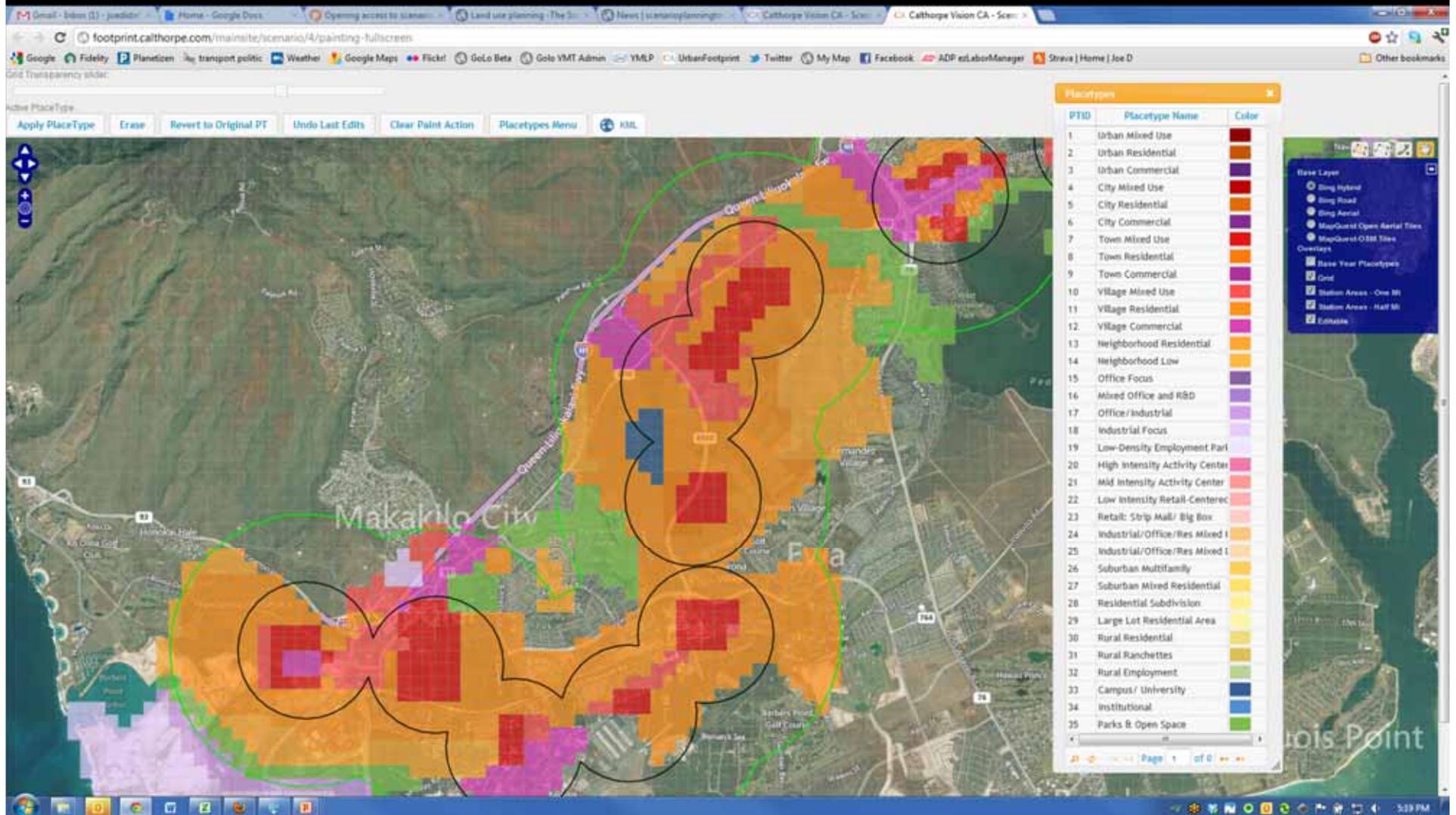
PTID	Placetype Name	Color
1	Urban Mixed Use	Dark Red
2	Urban Residential	Red-Orange
3	Urban Commercial	Purple
4	City Mixed Use	Red
5	City Residential	Orange
6	City Commercial	Purple
7	Town Mixed Use	Red
8	Town Residential	Orange
9	Town Commercial	Purple
10	Village Mixed Use	Red-Orange
11	Village Residential	Orange
12	Village Commercial	Purple
13	Neighborhood Residential	Orange
14	Neighborhood Low	Orange
15	Office Focus	Purple
16	Mixed Office and R&D	Purple
17	Office/Industrial	Purple
18	Industrial Focus	Purple
19	Low-Density Employment Parl	Purple
20	High Intensity Activity Center	Pink
21	Mid Intensity Activity Center	Pink
22	Low Intensity Retail-Centerec	Pink
23	Retail: Strip Mall/ Big Box	Pink
24	Suburban Multifamily	Yellow-Orange
25	Suburban Mixed Residential	Yellow-Orange
26	Residential Subdivision	Yellow
27	Large Lot Residential Area	Yellow
28	Rural Residential	Yellow
29	Rural Ranchettes	Yellow
30	Rural Employment	Yellow
31	Campus/ University	Blue
32	Institutional	Blue
33	Parks & Open Space	Green

Page 1 of 0

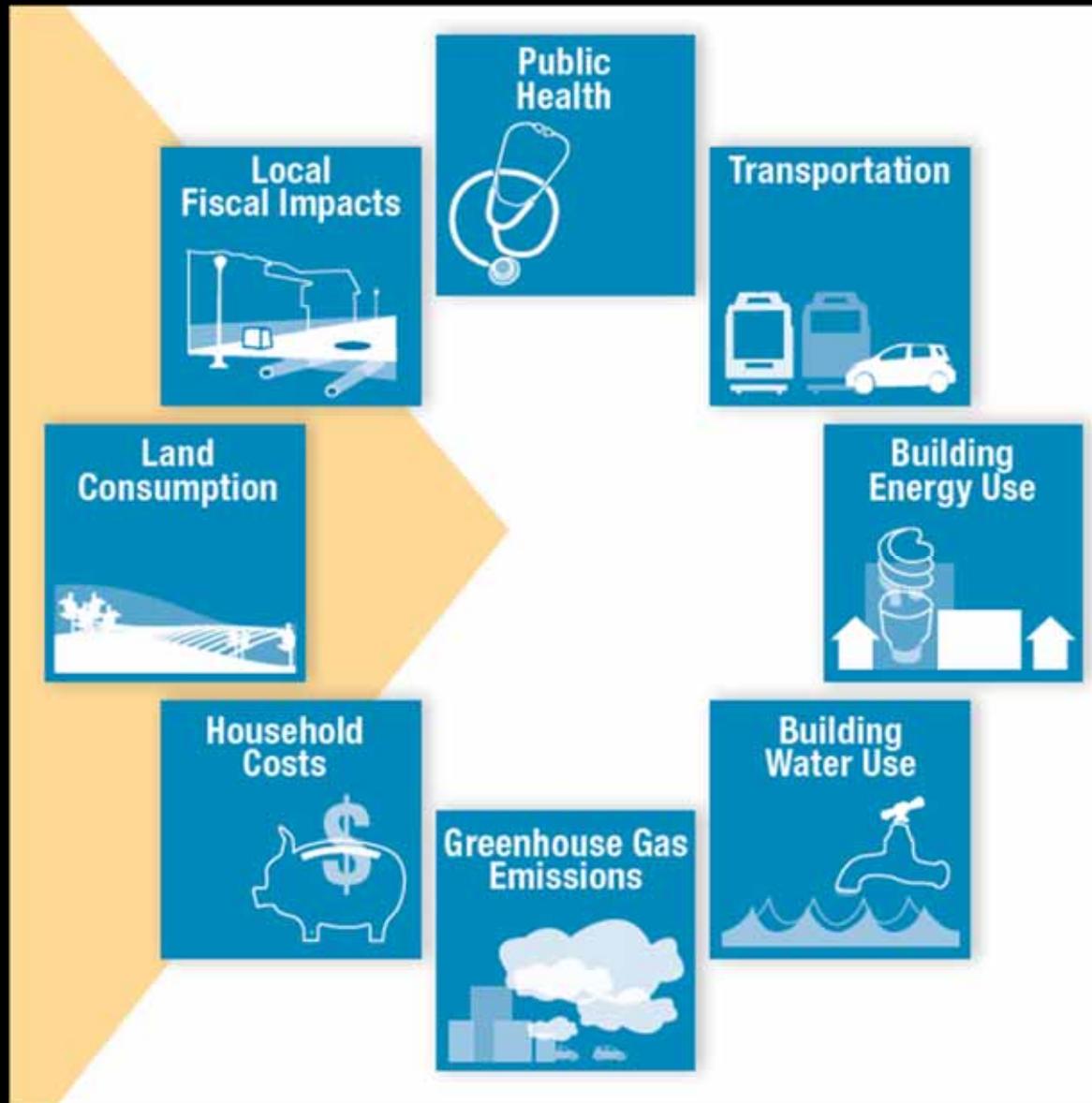
# Oahu Deployment



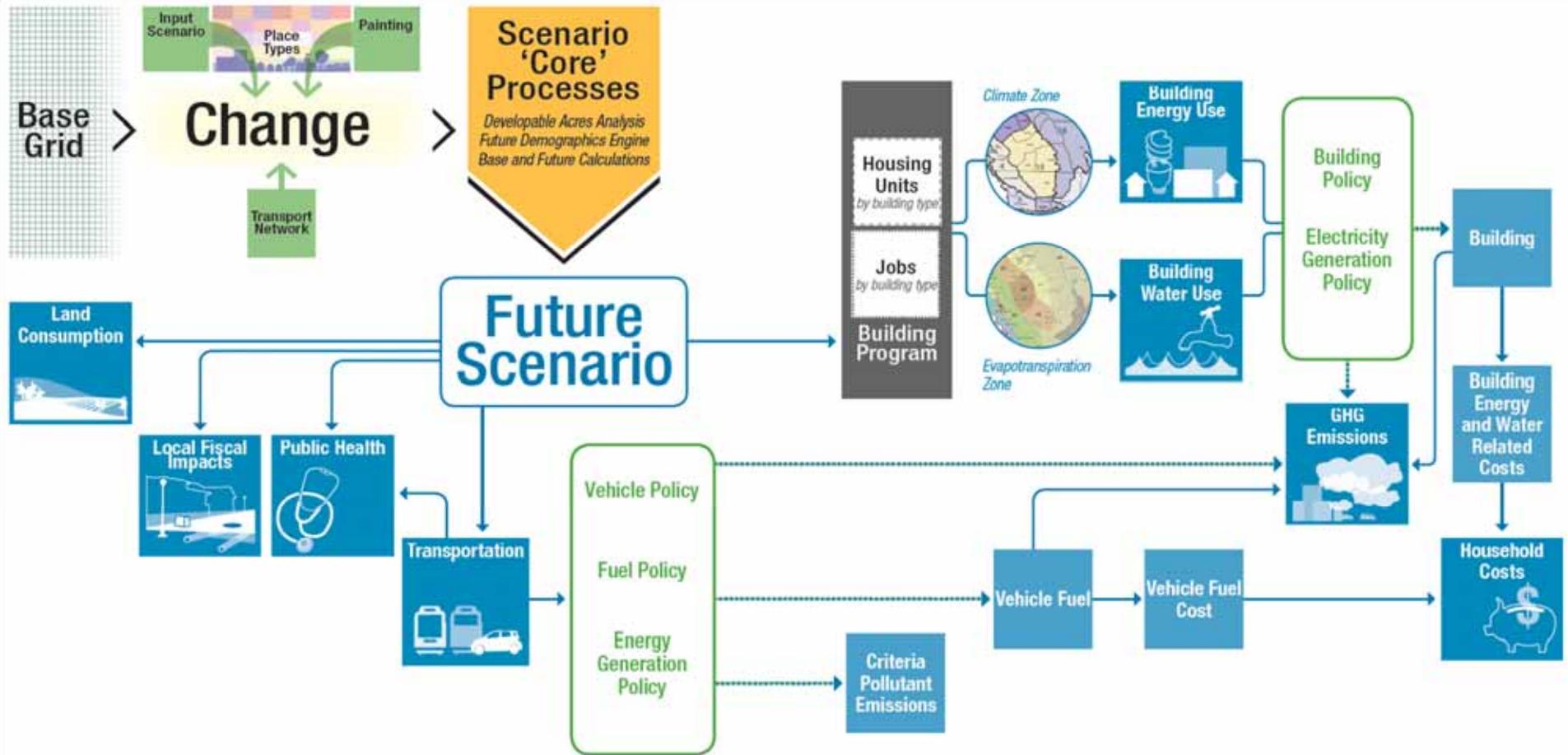
# Oahu Deployment



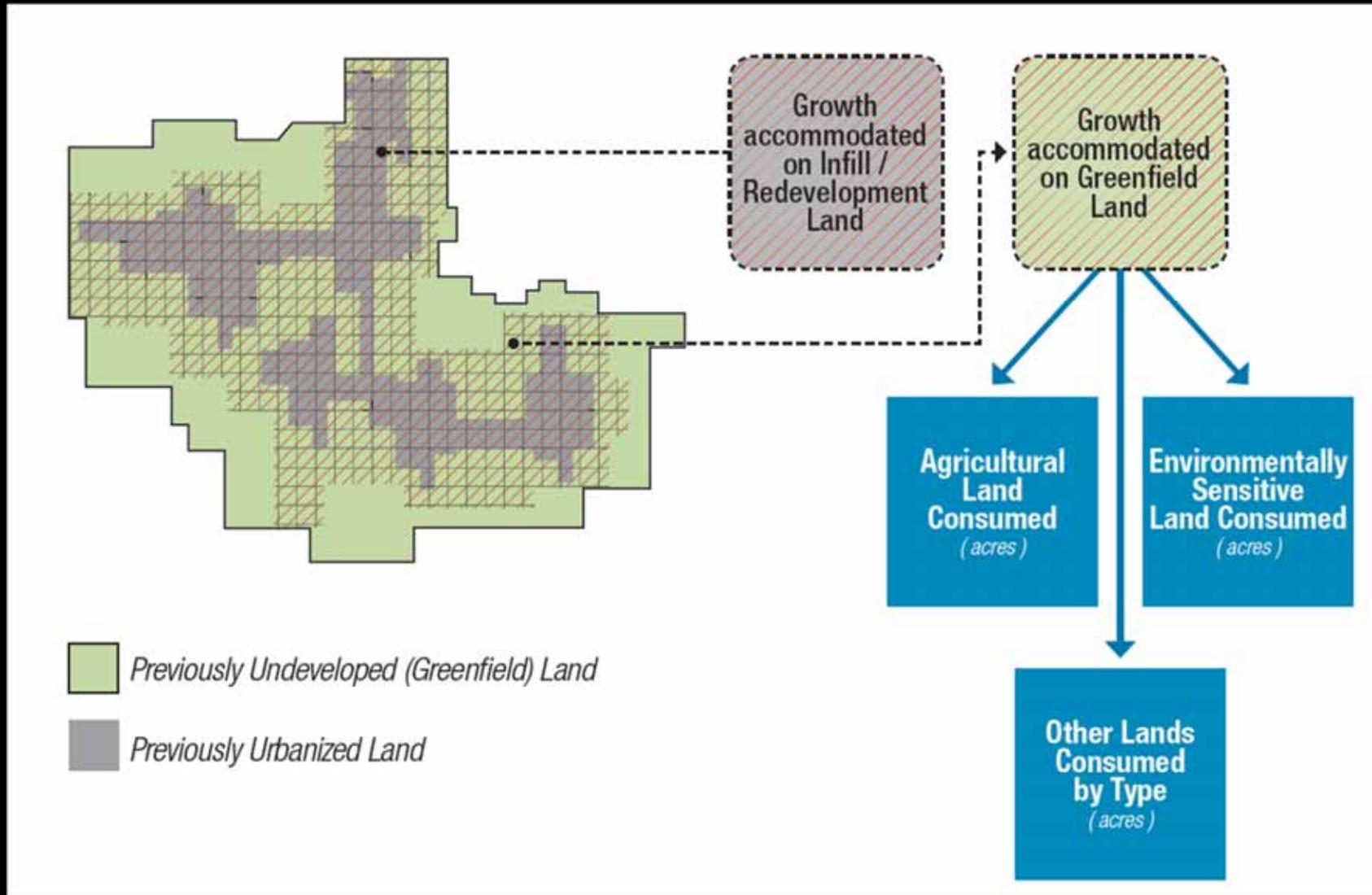
# UrbanFootprint Analysis Engines



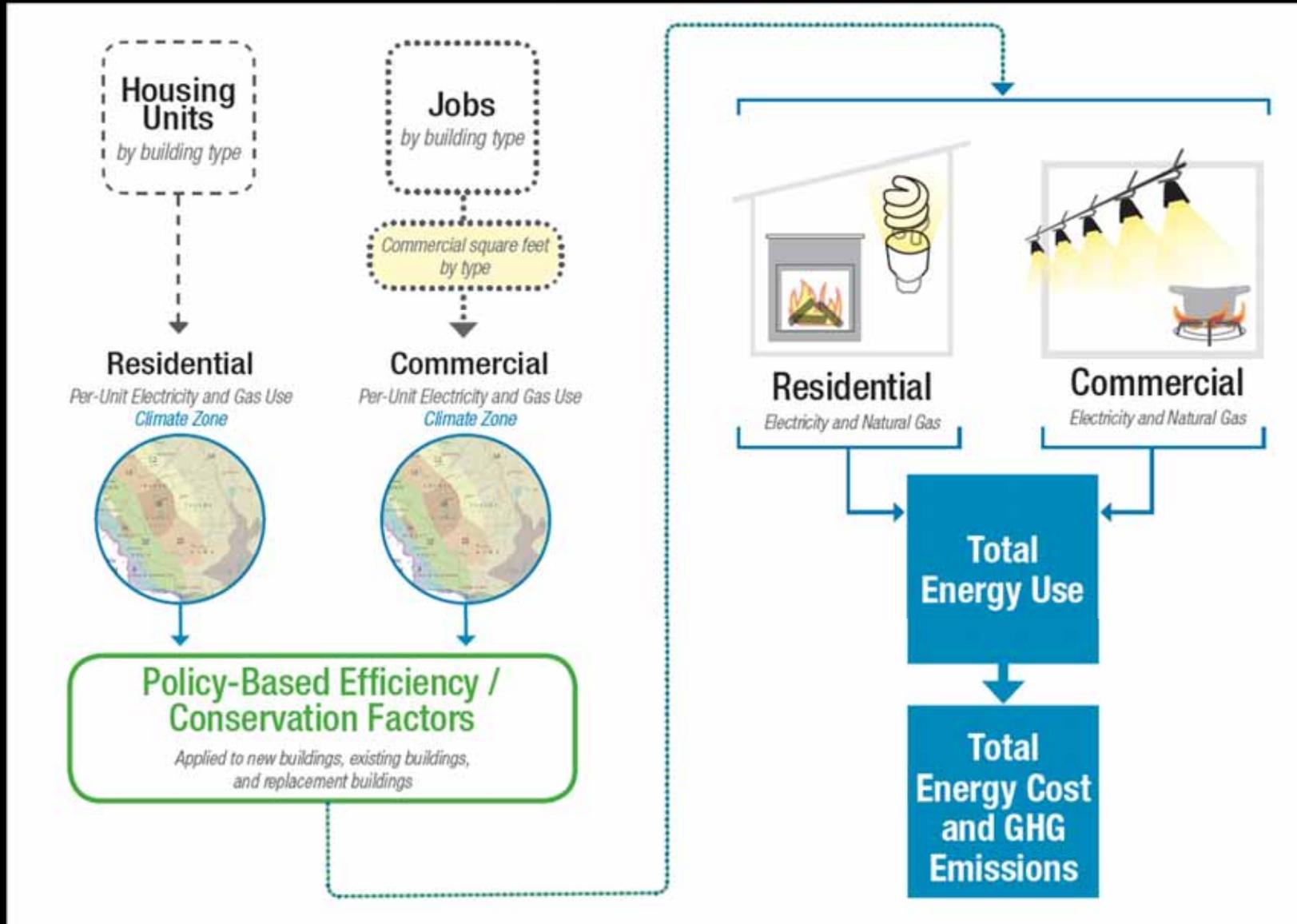
# UrbanFootprint Analysis Engines



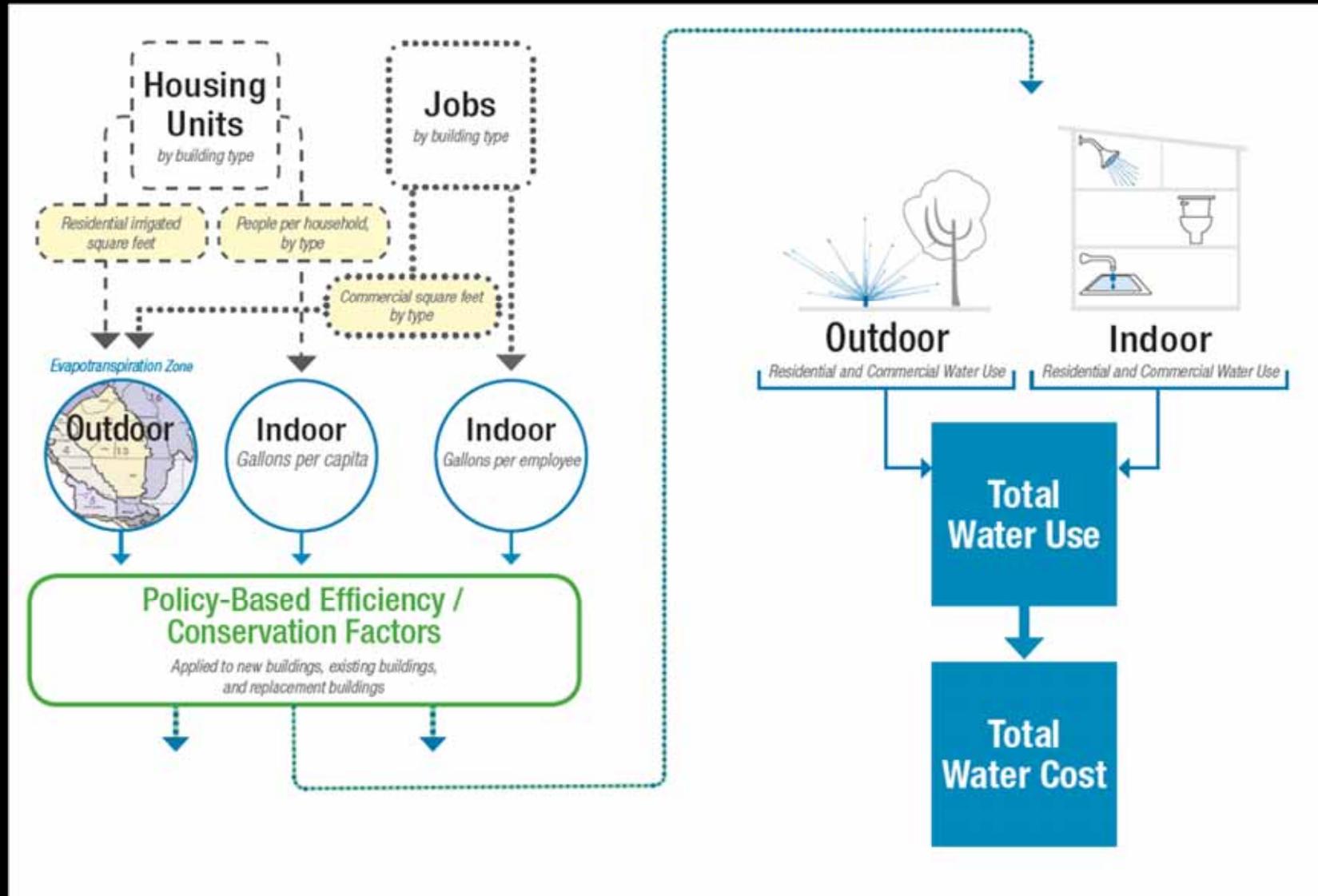
# Land Consumption



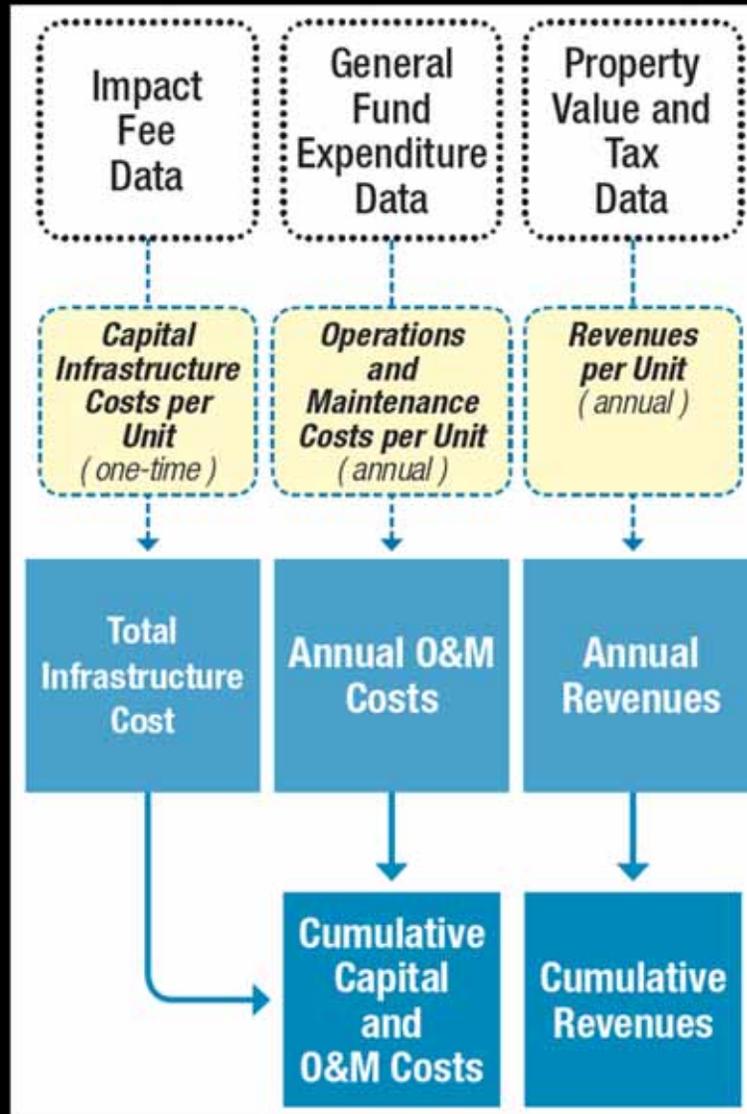
# Building Energy Use



# Building Water Use

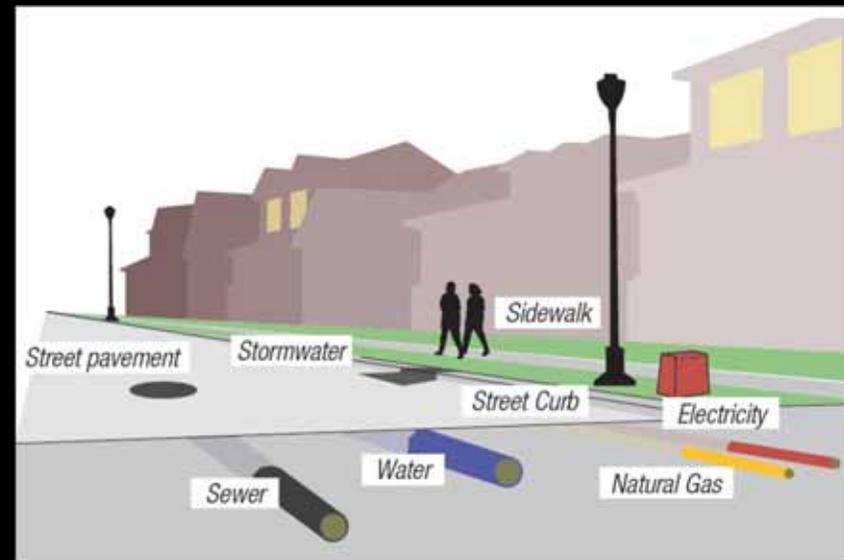


# Local Fiscal Impacts

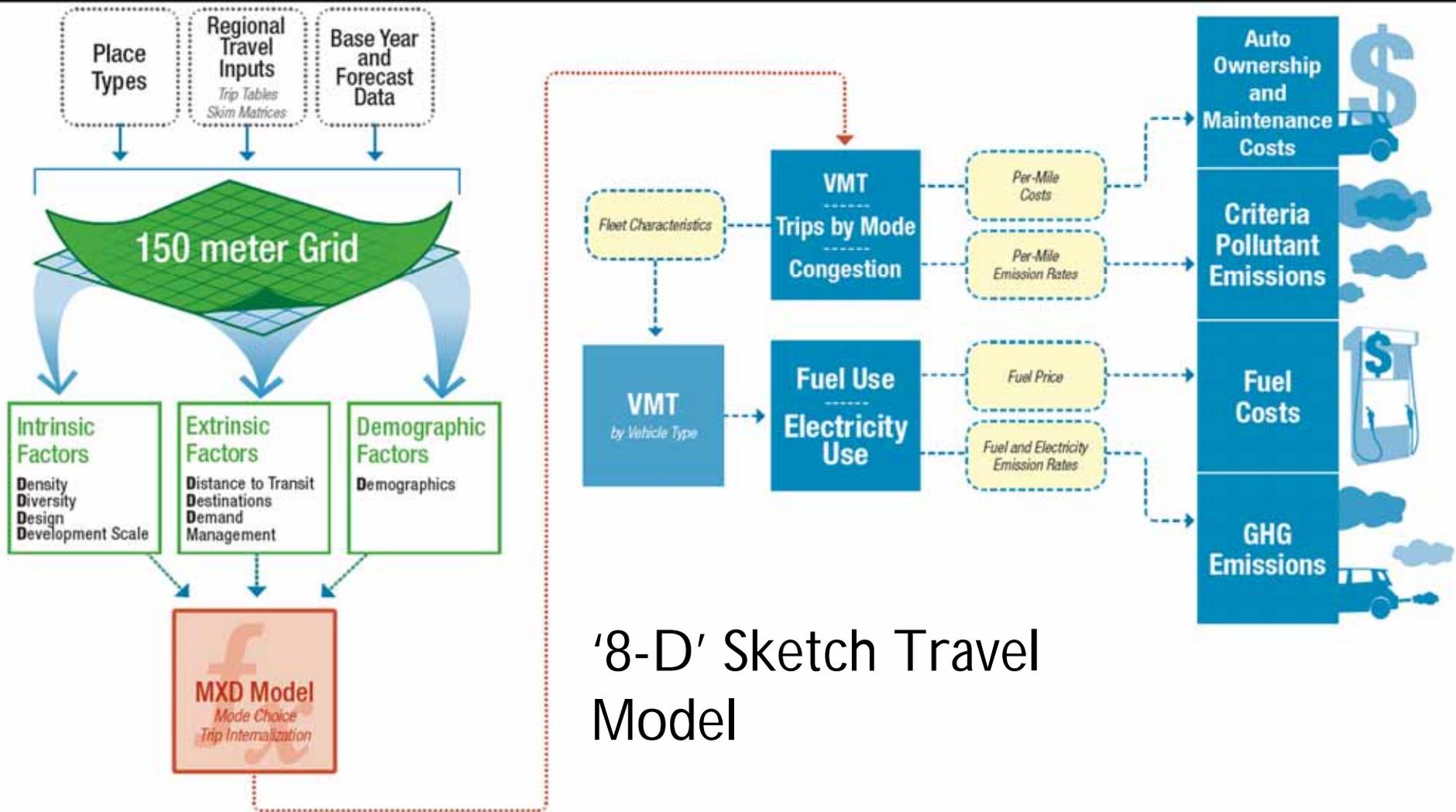


## Next Steps

- Assumptions Research
- IMPACS Model Integration



# Transportation



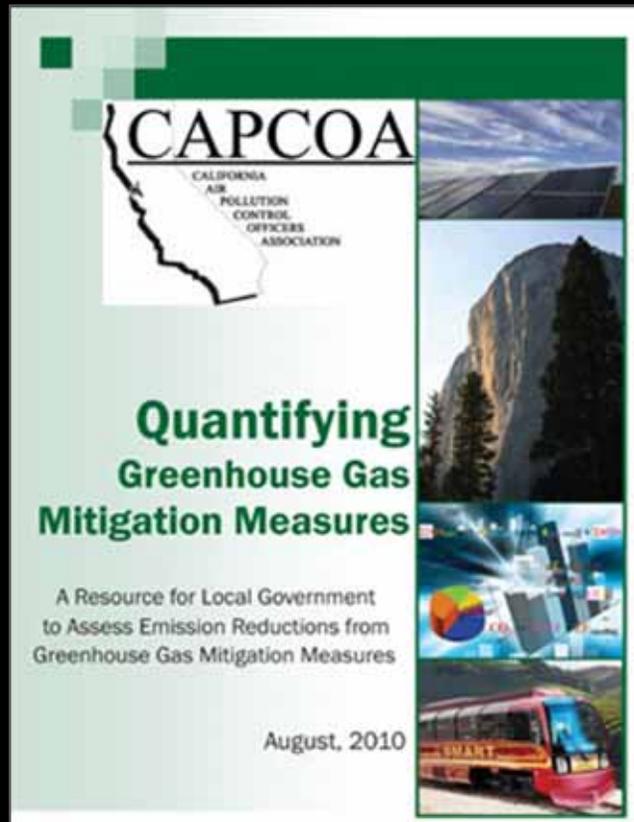
'8-D' Sketch Travel Model

# “8D” Factors that Affect Trips and VMT

1. **Density** dwellings, jobs per acre
2. **Diversity** mix of housing, jobs, retail
3. **Design** connectivity, walkability
4. **Destinations** regional accessibility
5. **Distance to Transit** rail proximity
6. **Development Scale** pop, jobs
7. **Demographics** household size, income
8. **Demand Management** pricing ...



# Demand Management Effects



- Parking pricing
- Transit service level
- Transit fare
- Employer commute programs
- Auto operating cost increase

# Steps to produce travel estimates

1. Fratar factoring **variable-distance** buffer for each scenario
2. Analyze geographic context **¼ & 1 mile** buffers
3. Trip generation **from ITE** daily trip rate parameters
4. Trip purpose splits **NCHRP** Factors, averaged among area types
5. Total raw trips by purpose **HBW, HBO, NHB; Productions, Attractions**
6. Auto ownership **for residents**
7. Model variables and log odds calculations **application of the 'D's**
8. Model application – all trips **produces grand total VMT**
9. Regional post-processes **congestion, VHT, pricing**



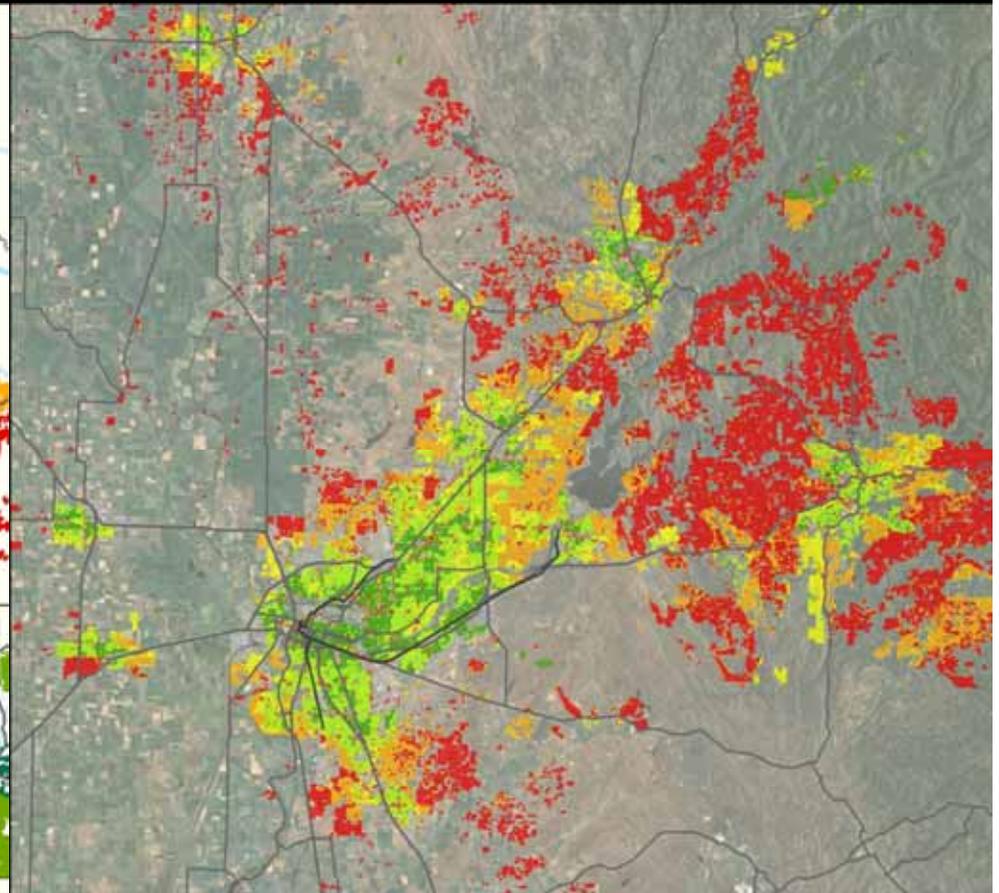
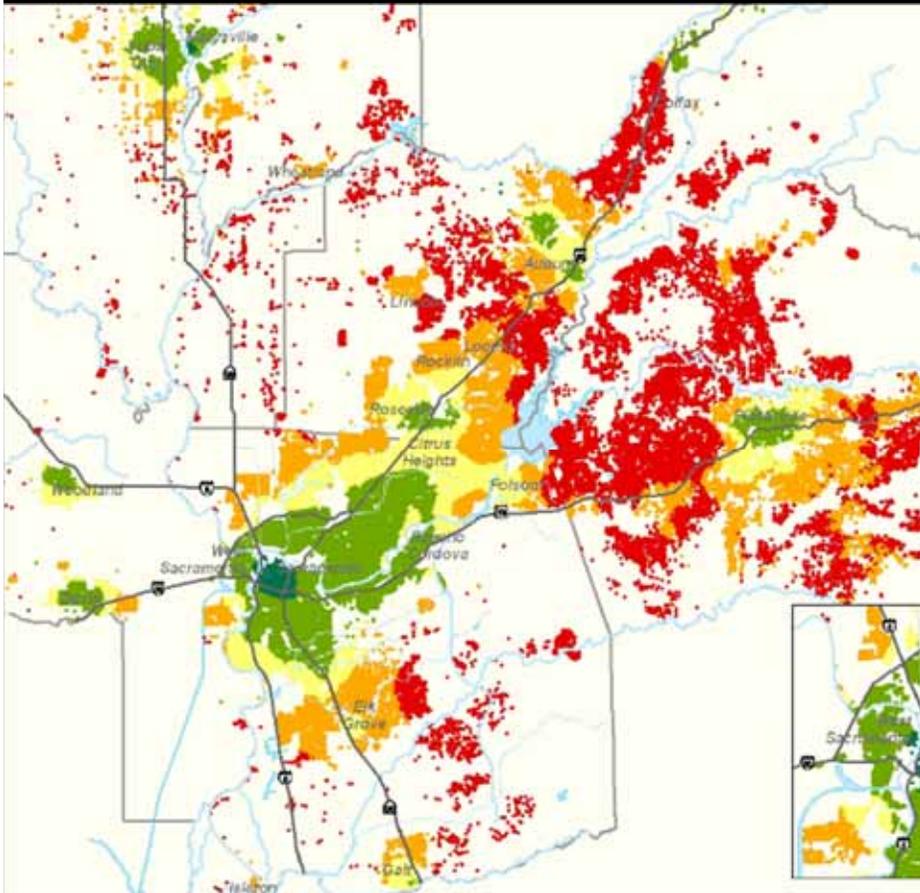
# Travel Model Validation

UrbanFootprint

Base-Year Vehicle Miles Traveled (VMT) Validation Chart

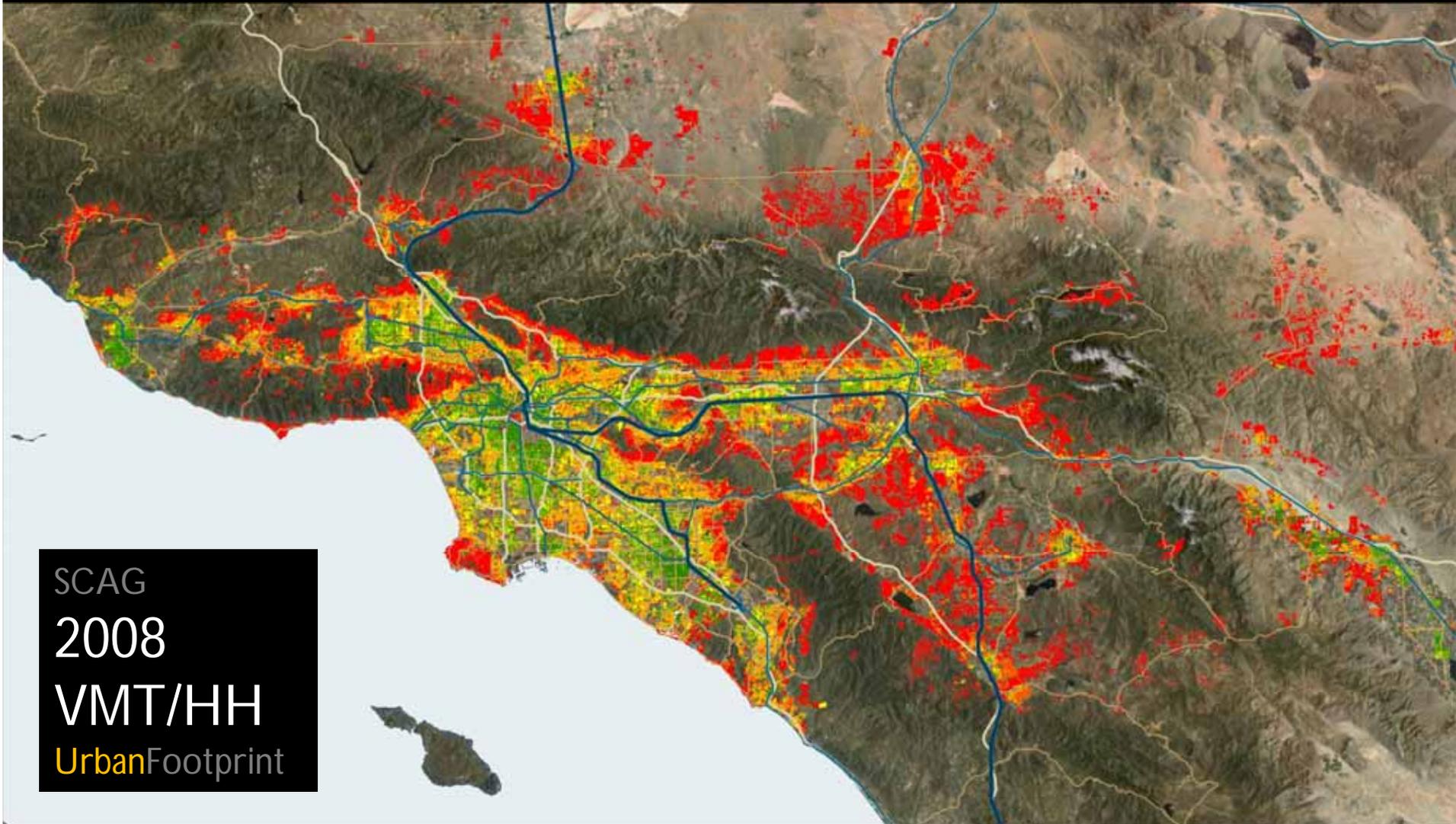
Region	Base Year Validation Daily VMT	UrbanFootprint Modeled Base Year Daily VMT
Sacramento Area (6 Counties, SACOG)	50,040,540 <small>(Fehr &amp; Peers, SACOG - SACMET model, 2008 MTP)</small>	53,632,530
San Francisco Bay Area (9 counties, ABAG/MTC)	143,681,890 <small>(Fehr &amp; Peers, MTC - MTC model, 2009 RTP)</small>	143,784,640
Southern California (6 Counties, SCAG)	378,105,370 <small>(Fehr &amp; Peers, SCAG - SCAG model, 2008 RTP)</small>	378,117,580
San Diego (SANDAG)	80,584,670 <small>(Fehr &amp; Peers, SANDAG - SANDAG model, 20011 RTP/SCS)</small>	82,432,940
San Joaquin Valley (8 Counties)	114,532,890 <small>(Fehr &amp; Peers, UC Davis - CSTDM 2009 Model)</small>	111,197,210



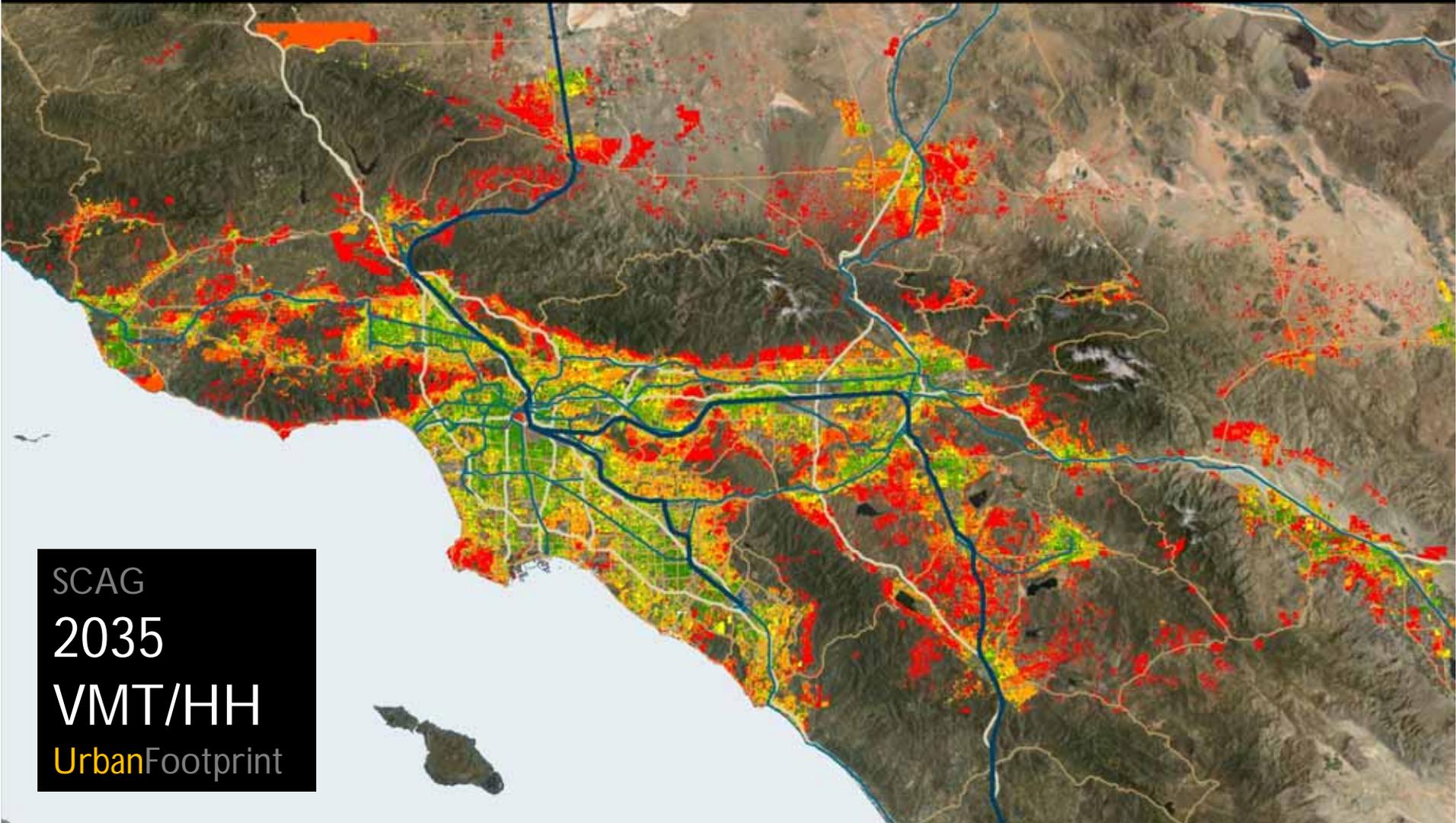


SACOG  
 2005 VMT/HH  
 SACSIM

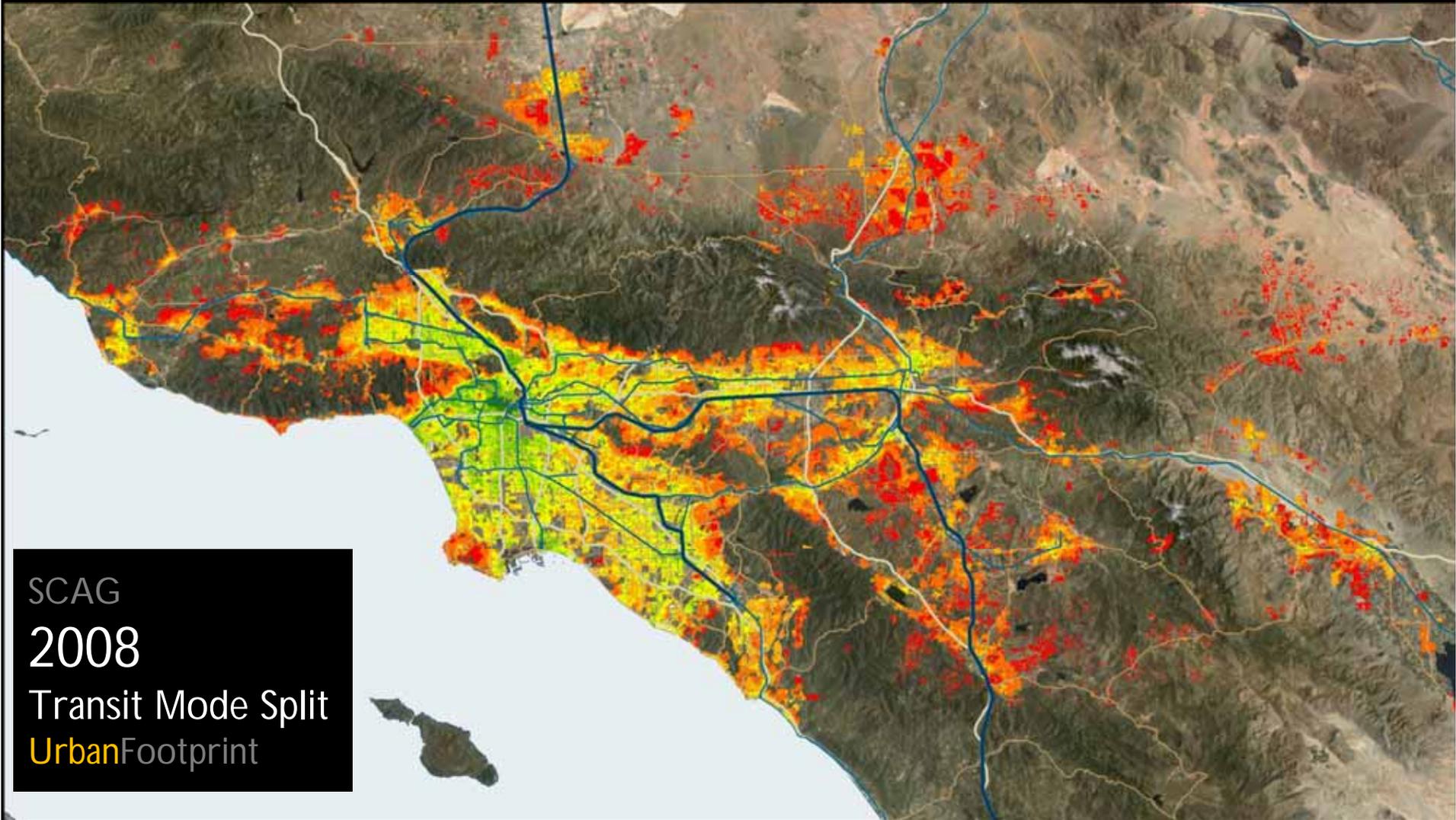
SACOG  
 2005 VMT/HH  
 UrbanFootprint



SCAG  
2008  
VMT/HH  
UrbanFootprint



SCAG  
2035  
VMT/HH  
UrbanFootprint

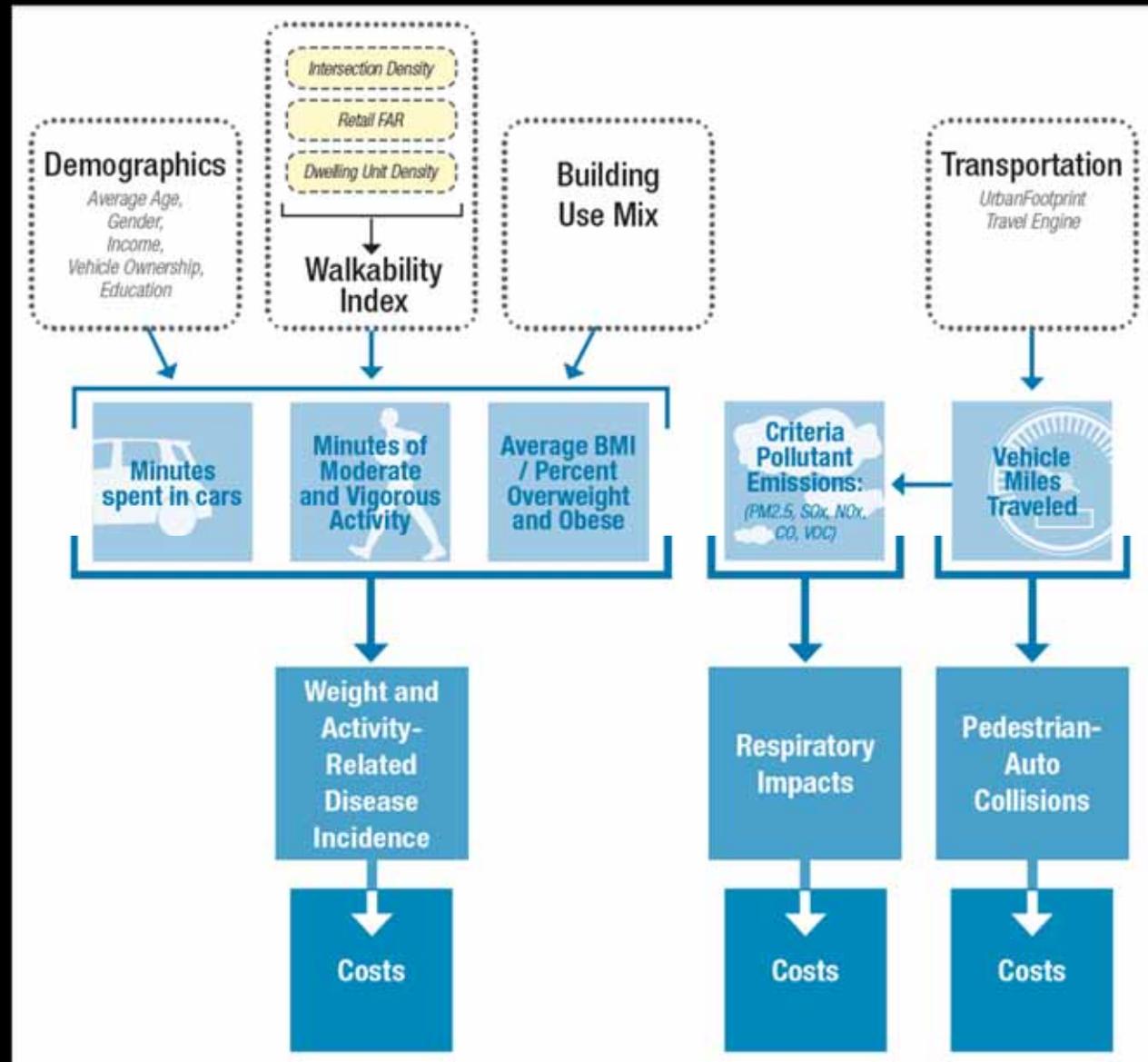


SCAG  
2008  
Transit Mode Split  
UrbanFootprint

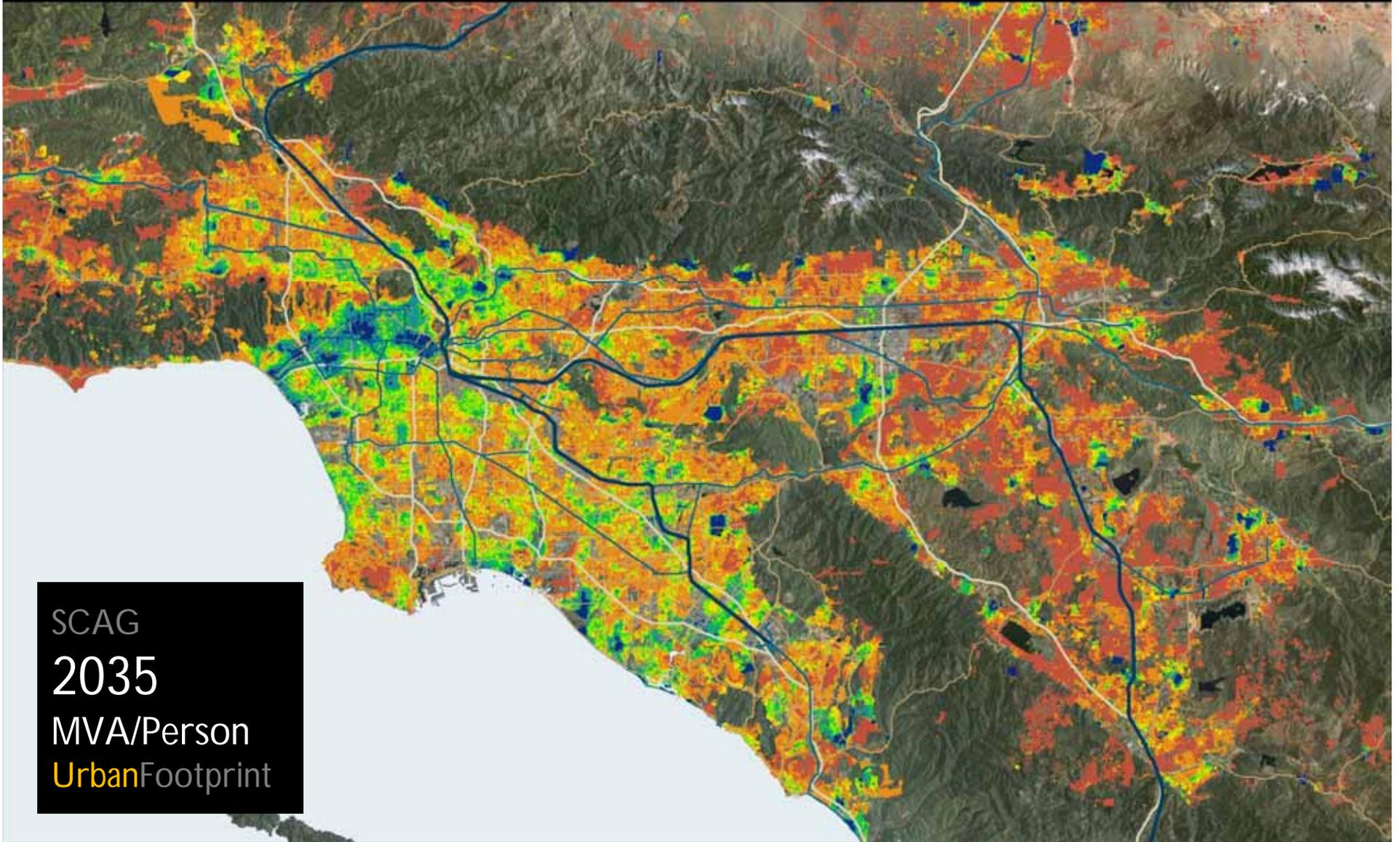
# Public Health

## Next Steps

- ITHIM Integration and Testing



# Public Health



SCAG  
2035  
MVA/Person  
UrbanFootprint

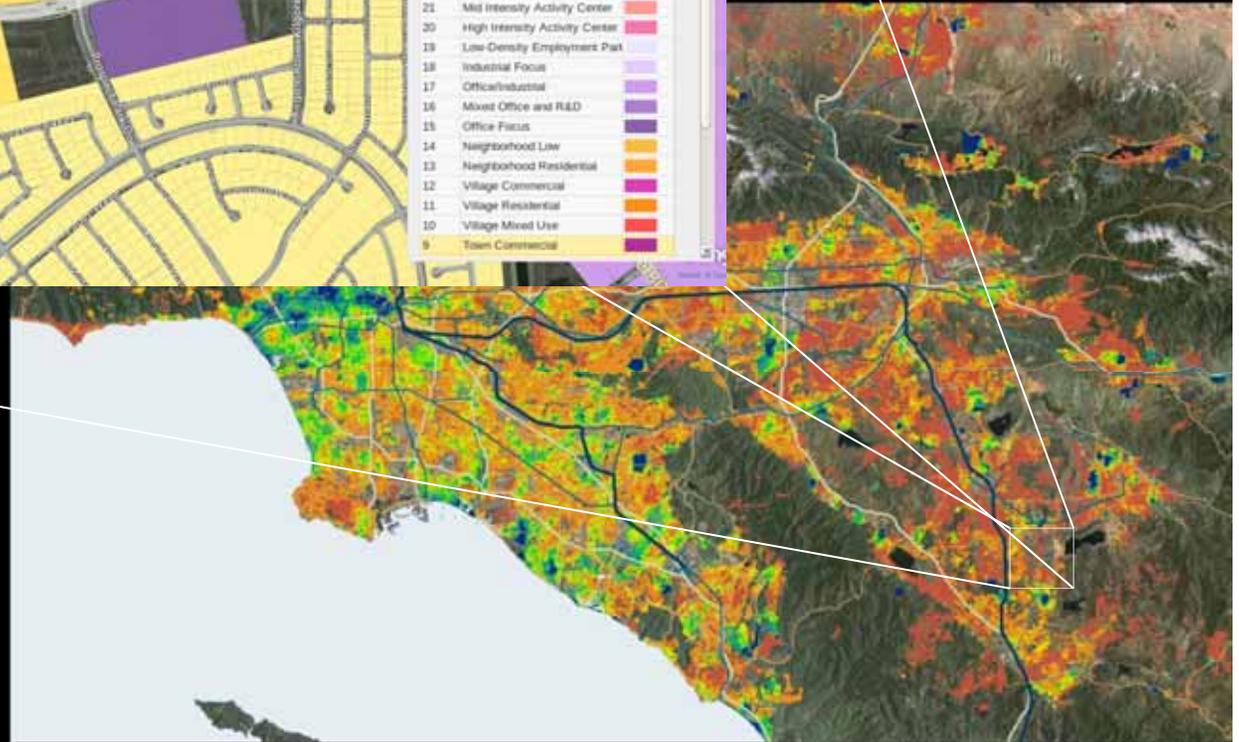


## Urban Footprint in the SCAG region

- ✓ UrbanFootprint Overview
- ✓ Potential to Assist Regional & Local Planning
- ✓ Future Improvements



# Regional & Local Coordination

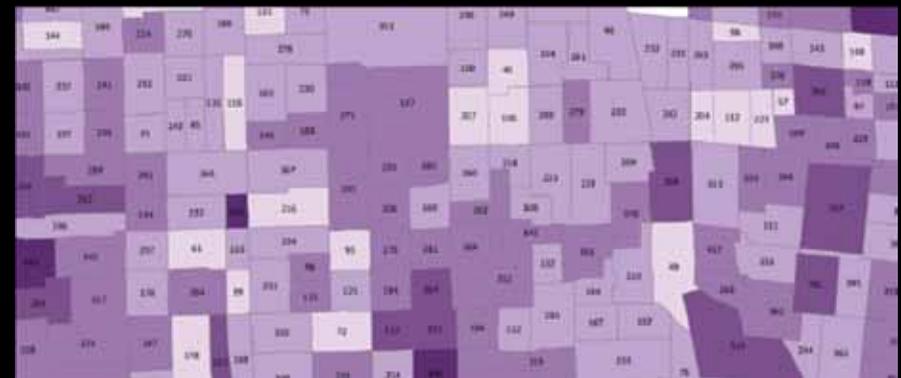
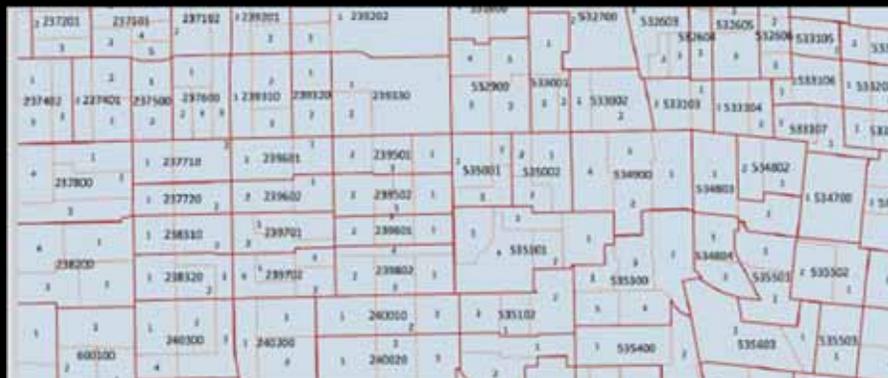


# Regional & Local Coordination

- **Customize UrbanFootprint for the SCAG region**
  - *Meet the specific needs of local users*
    - *Subregions*
    - *Cities*
  - *Work with subregions & locals to refine design improvements*
- **Streamline the RTP/SCS process**
  - *Better inform local & regional planning*
  - *Allow for meaningful local review of base year data*
- **Ease of use: Web-based interface**
  - *Low friction of entry for new users*
  - *Potential for broader adoption*

# Regional & Local Coordination

- Work together to update base year data
  - City review of existing base data load at parcel-level resolution
    - Edit land use codes on parcels
    - Re-run base load to see updated results



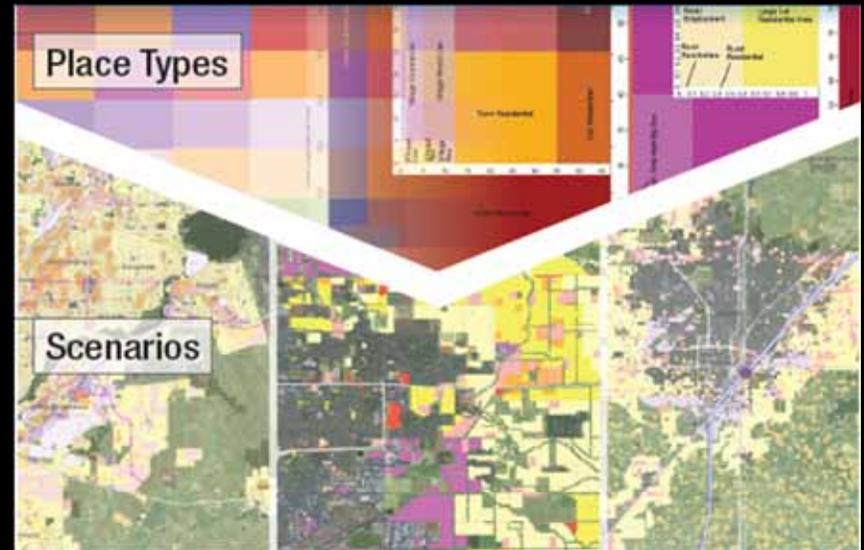
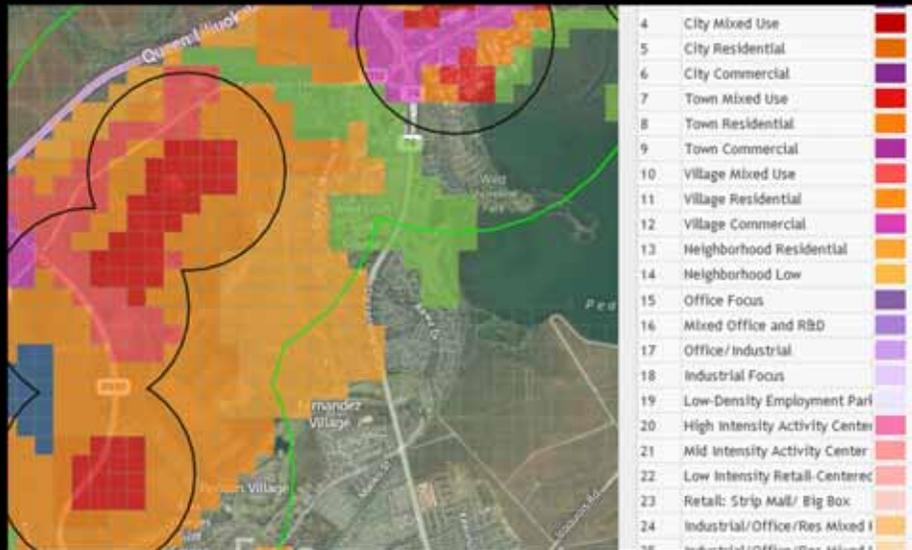
# Regional & Local Coordination

- Localize UrbanFootprint building & place types
  - *Calibrate the current library of building & place types*
    - *Add new buildings based on local examples*
    - *Change calibrations of building types*
    - *Study local areas to calibrate place types subregionally*



# Regional & Local Coordination

- Locals create scenarios with subregional COGS and SCAG
  - *Translate or paint local plans*
  - *Quickly analyze relationships to sub-regional & regional plans*
  - *Run UrbanFootprint impact modules to assess plan performance*
  - *Easily create additional scenarios to test against baseline plan*





## Urban Footprint in the SCAG region

- ✓ UrbanFootprint Overview
- ✓ Potential to Assist Regional & Local Planning
- ✓ Future Improvements



# Next Steps for UrbanFootprint

- Upgrade engines
  - Advanced travel model
    - *Network-based*
    - *User-editable transportation features*
  - Next-generation public health engine
    - *ITHIM integration*
  - Enhanced redevelopment analysis
    - *Integrate functionality to use additional urban form data inputs*
      - *FAR*
      - *Built Up Area (BUA)*
- Performance optimization
  - Computer clustering
- Upgrade to 3D
  - Allow for three-dimensional scenario display & analysis

# Agency Partnerships

- *SCAG, SACOG, MPOs*
  - *Customize functionality to allow for closer coordination with locals*
  - *Evolve scenario painting and development capability for RTP/SCS/local planning processes*
- *CDPH*
  - *Enhance public health engine by integrating with ITHIM*
- *Caltrans*
  - *Integrate Sketch7 transportation model functionality*
- *OPR/SGC*
  - *Develop state home and support system for UrbanFootprint*
- *CEC/DWR*
  - *Advance energy and water capabilities*
- *ARB*
  - *Refine vehicle, fuels, and fleet assumptions and methodology*



For More Information  
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