Appendix A
Data Metrics Report – Regional and Statewide Indicators for SB 150

Appendix A: Data Metrics Report

This document describes the data sources, as well as any data processing and analysis steps, the California Air Resources Board (CARB) used in developing the reported SB 375 performance indicators. Charts and data presented by region are typically grouped and labeled as representing the Big 4 MPOs (i.e., representing the Bay Area/MTC, Sacramento/SACOG, Southern California/SCAG, and San Diego/SANDAG MPO regions), the San Joaquin Valley (SJV) MPOs (i.e., representing the San Joaquin/SJCOG, Stanislaus/StanCOG, Merced/MCAG, Madera/MCTC, Fresno/FCOG, Kings/KCAG, Tulare/TCAG, and Kern/KCOG regions), and the remaining MPOs (i.e., representing the Butte/BCAG, Shasta/SRTA, Tahoe/TMPO, Monterey Bay/AMBAG, San Luis Obispo/SLOCOG, and Santa Barbara/SBCAG regions).

Greenhouse Gas Emissions / Vehicle Miles Traveled

SB 150 requires CARB to assess the progress made by each MPO in meeting the regional greenhouse gas (GHG) emissions reduction targets. Unfortunately, CARB was unable to find a data source that would allow us to confidently report GHG emissions reductions or changes in vehicle miles travelled (VMT) by region. Fuel sales data reported by California Department of Tax and Fee Administration[1] (CDTFA) is used for the statewide analysis in this report, but is not available at the county-level for use in a regional analysis. The California Department of Transportation's (Caltrans') Highway Performance Monitoring System (HPMS) does provide an estimate of vehicle miles traveled (VMT) by county, but CARB found some discrepancies that need to be addressed before this information can be used.

Method

To estimate passenger vehicle GHG emissions and VMT, CARB utilized a variety of publicly available data sources. The method relies on reported fuel sales, the carbon content of those fuels (grams carbon dioxide (CO_2)/gallon), along with adjustments to remove heavy-duty vehicles that consume gasoline, but are not part of the SB 375 program.

Data sources and methods include:

- Reported annual motor vehicle gasoline sales data (gallons) from CDTFA for 2001- 2016.
- EMFAC2017[2] to remove the contribution of heavy-duty gasoline trucks from CDTFA gasoline fuel sales.
- The carbon content of gasoline (kilograms CO_2/gallon)[3] to estimate GHG emissions from passenger vehicles when combined with adjusted gasoline sales.
- EMFAC2017[4] fleet-average CO_2 emission rates (grams/mile) to estimate passenger vehicle VMT from passenger GHG emissions.

[1] CDTFA, Taxable Gasoline Gallons 10 Year Report, https://www.cdtfa.ca.gov/taxes-and-fees/spftrpts.htm, accessed 10/16/2018.
[2] Based on data from EMFAC 2017 model and EMFAC can be found at https://www.arb.ca.gov/msei/categories.htm#onroad_motor_vehicles.
[3] GHG (CO_2) = Gasoline Sales × carbon intensity of Gasoline, where the carbon intensity of gasoline is 10.21 kg CO_2 per gallon from Documentation of California's Greenhouse Gas Inventory (11th Edition) https://www.arb.ca.gov/cc/inventory/doc/docs1/1a3_notspecified_transportation_fuelcombustion_distillate_co2_2015.htm.
[4] The fleet-average CO_2 emission rate is the average CO_2 emission rate of all gasoline and diesel passenger vehicles (gram/mile), based on EMFAC 2017 fleet mix and fleet-specific CO_2 emission rates.

- EMFAC SB 375 tool[5] to adjust passenger vehicle GHG emissions estimated consistent with the SB 375 program, which excludes the benefits of state policies (e.g. Pavley I, Advanced Clean Cars, and the Low Carbon Fuel Standard).
- Department of Finance (DOF) population data[6] to estimate per capita GHG emissions and VMT. Per capita GHG and VMT results were both normalized and presented as a percent change relative to 2005.

Results

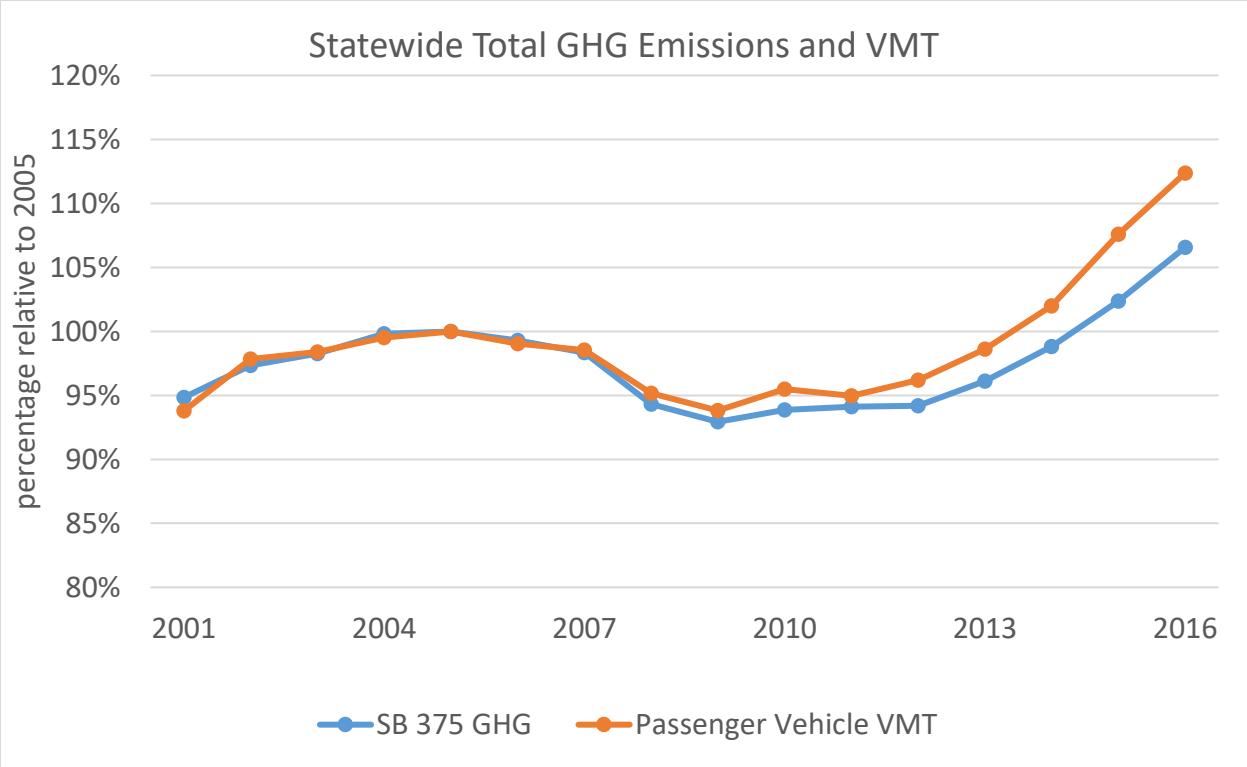
As shown in the *Statewide Total GHG Emissions and VMT* Figure, the resulting passenger vehicle GHG emissions for the SB 375 program (blue) increased by 7 percent between 2005 and 2016, while VMT (red) increased by 12 percent for the same time period. Further, it can be observed that both emissions and VMT declined between 2005 to 2012 and rose again after 2012, due to important socioeconomic factors[7,8] that influence how much people drive.

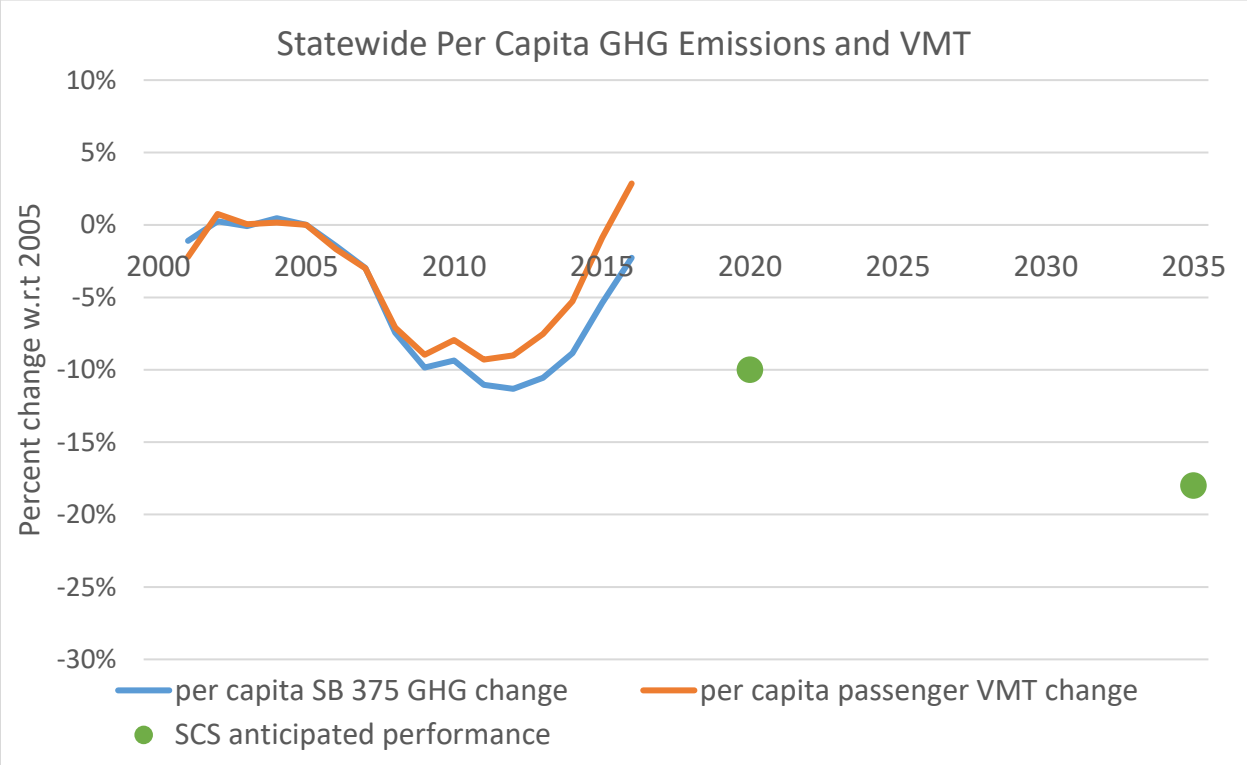
The *Statewide Per Capita GHG Emissions and VMT* Figure shows per capita GHG emissions and VMT relative to 2005. In 2016, GHG emissions per capita (blue) is 2 percent lower and VMT per capita (red) is 3 percent higher relative to 2005. The anticipated GHG emissions reductions from the MPOs adopted SCSs are 10 percent and 18 percent per capita in 2020 and 2035 respectively (green).

Next Steps

As indicated above, CARB staff could not find a better data source to report GHG and VMT per capita by region. Although CARB staff found discrepancies in the current HPMS data that prevented us from using to assess regional progress, CARB staff hope to utilize it in future SB 150 reports. Caltrans has initiated various data improvement efforts to support and enhance the capabilities of the State to collect and integrate data from federal, state, and local agencies.

[5] EMFAC provides a sub-module for SB 375 that allows a user to remove the impacts of specific state programs. Information about this module can be found in the EMFAC documentation at https://www.arb.ca.gov/msei/downloads/emfac2017-volume-iii-technical-documentation.pdf
[6] DOF, Table E-2. California County Population Estimates and Components of Change by Year, California Department of Finance, http://www.dof.ca.gov/Forecasting/Demographics/Estimates/, accessed 10/16/2018
[7] Hymel, Kent M. "Factors influencing vehicle miles traveled in California: Measurement and analysis." Final Report, 2014. https://www.csus.edu/calst/frfp/vmt_trends_hymel_report.pdf
[8] Gillingham, Kenneth. "Identifying the elasticity of driving: evidence from a gasoline price shock in California." Regional Science and Urban Economics 47 (2014): 13-24.





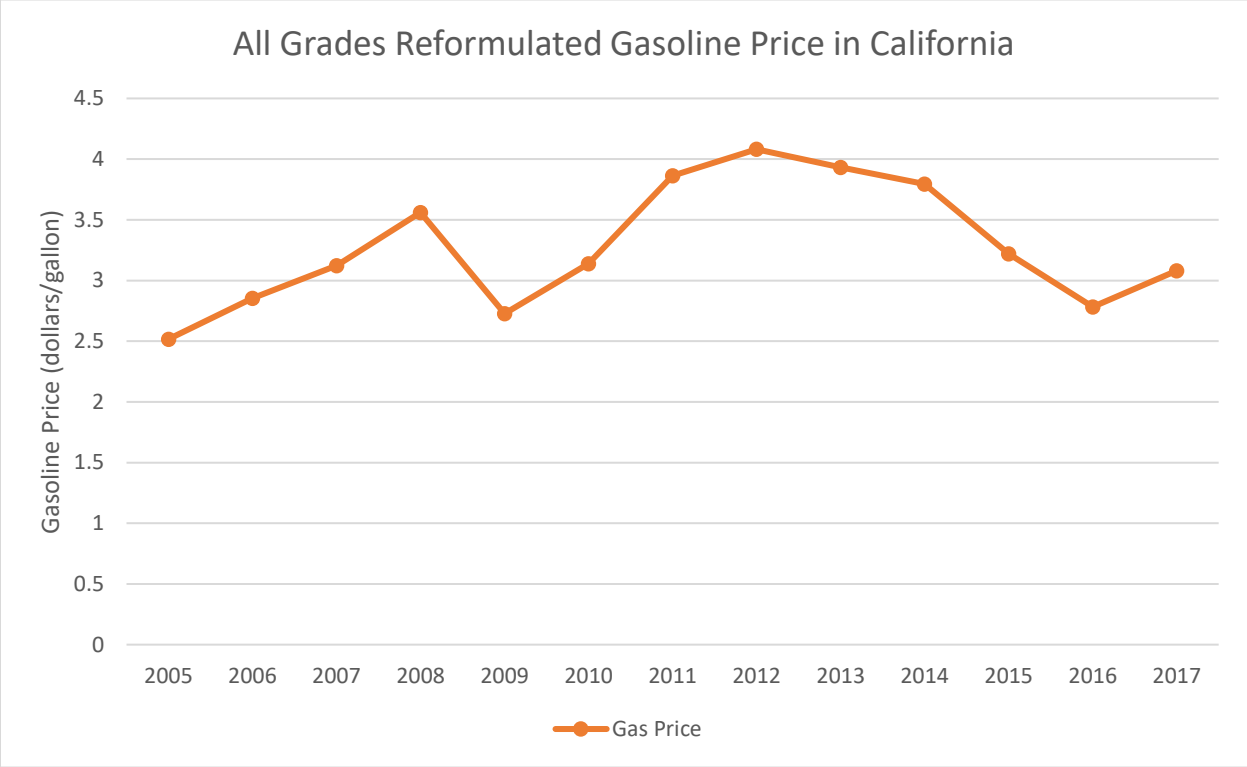
Note: The estimated GHG emissions and VMT includes non-MPO regions and inter-regional travel that are not included in SCSs (i.e., XX trips). The 18 MPO regions comprise approximately 96% of statewide VMT in calendar year 2016 according to EMFAC 2017. This information can be found at https://www.arb.ca.gov/emfac/2017/.

Other Factors Influencing Personal Vehicle Travel

Statewide Gasoline Prices

CARB staff calculated the trend in statewide gasoline prices using the annual average all grades reformulated gasoline price in California from the Weekly California All Grades Reformulated Retail Gasoline Prices dataset reported by the U.S. Energy Information Administration (EIA): https://www.eia.gov/petroleum/gasdiesel/.

The figure below depicts the up-and-down pattern from 2005 through 2017, with a noteworthy continuous gas price decrease starting from a peak in 2012 to 2016.

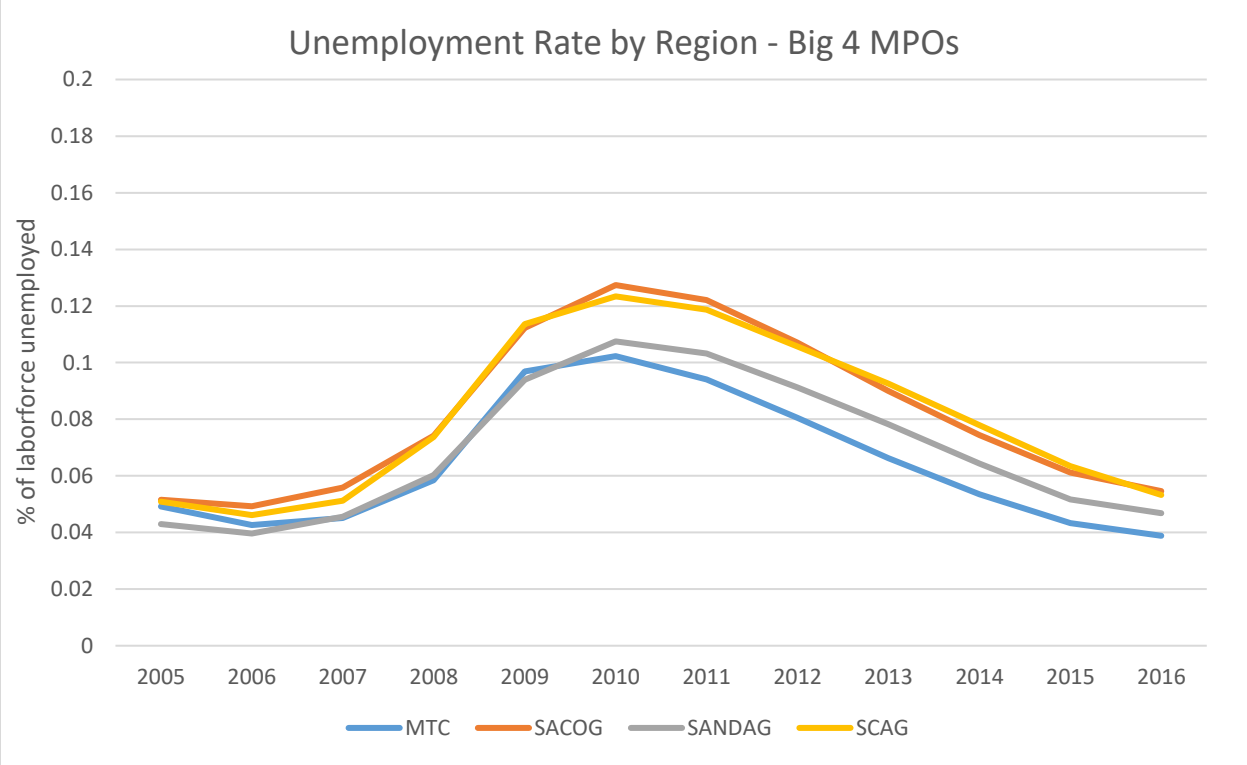


Data Source: U.S. EIA

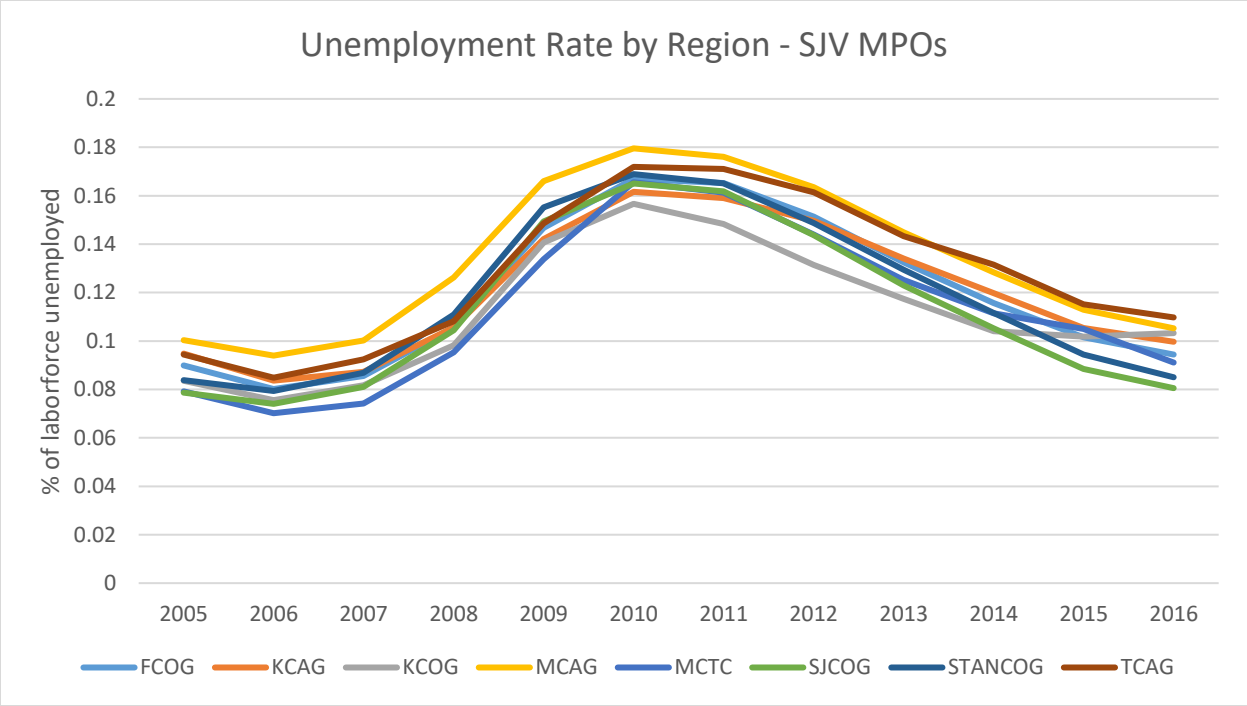
Unemployment Rate and Available Jobs

CARB staff analyzed unemployment rates and available jobs data for all MPOs from 2005 to 2016, based on county-level labor force and employment rate annual reports from California Employment Development Department (EDD): http://www.labormarketinfo.edd.ca.gov/data/unemployment-and-labor-force.html.

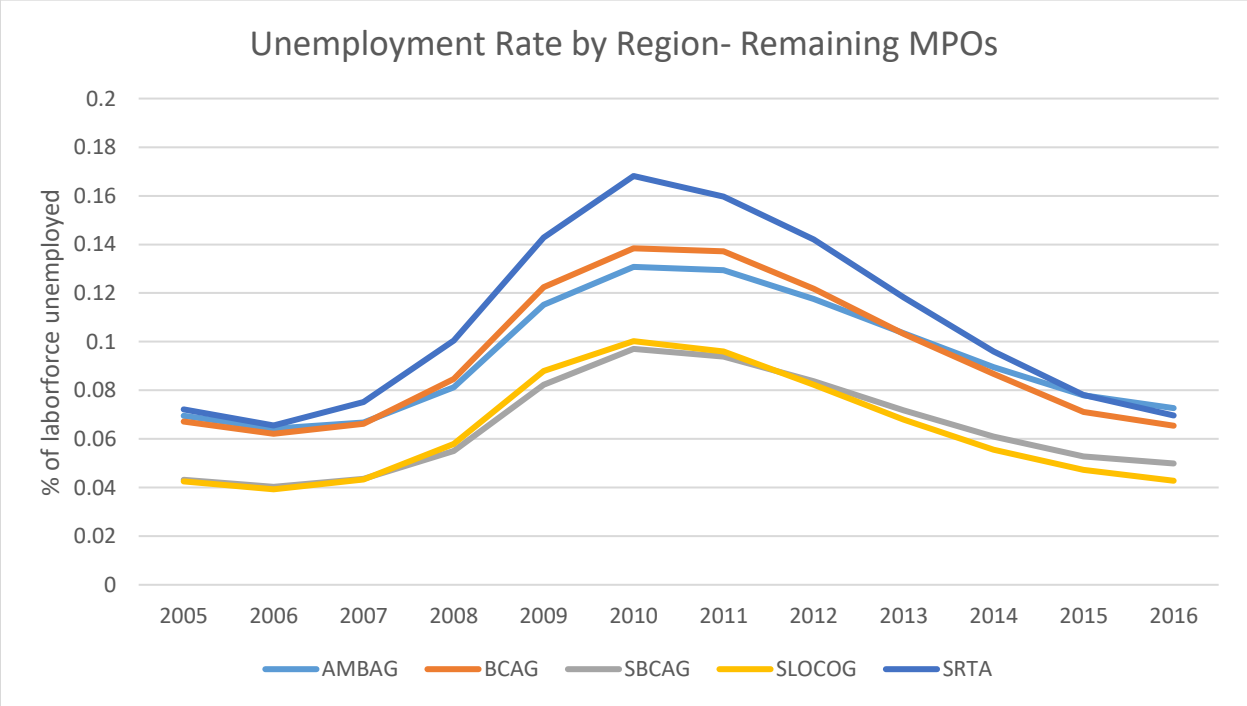
The following three figures show the unemployment rates from 2005 to 2016 grouped by the Big 4 MPOs (i.e., representing the Bay Area/MTC, Sacramento/SACOG, Southern California/SCAG, and San Diego/SANDAG regions), the San Joaquin Valley (SJV) MPOs (i.e., representing the San Joaquin/SJCOG, Stanislaus/StanCOG, Merced/MCAG, Madera/MCTC, Fresno/FCOG, Kings/KCAG, Tulare/TCAG, and Kern/KCOG regions), and the remaining small MPOs (i.e., representing the Butte/BCAG, Shasta/SRTPA, Tahoe/TMPO, Monterey Bay/AMBAG, San Luis Obispo/SLOCOG, and Santa Barbara/SBCAG regions). MPO level unemployment rates are calculated based on county-level data from EDD.



Data Source: California EDD



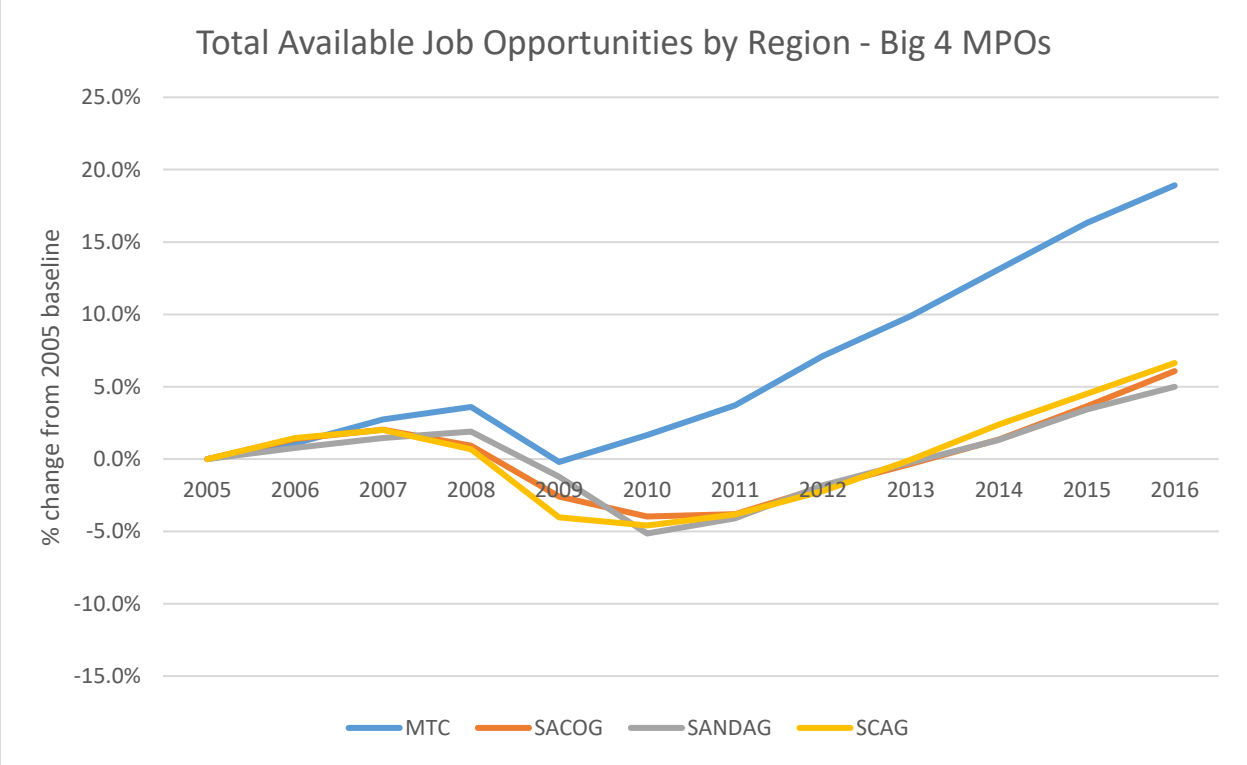
Data Source: California EDD



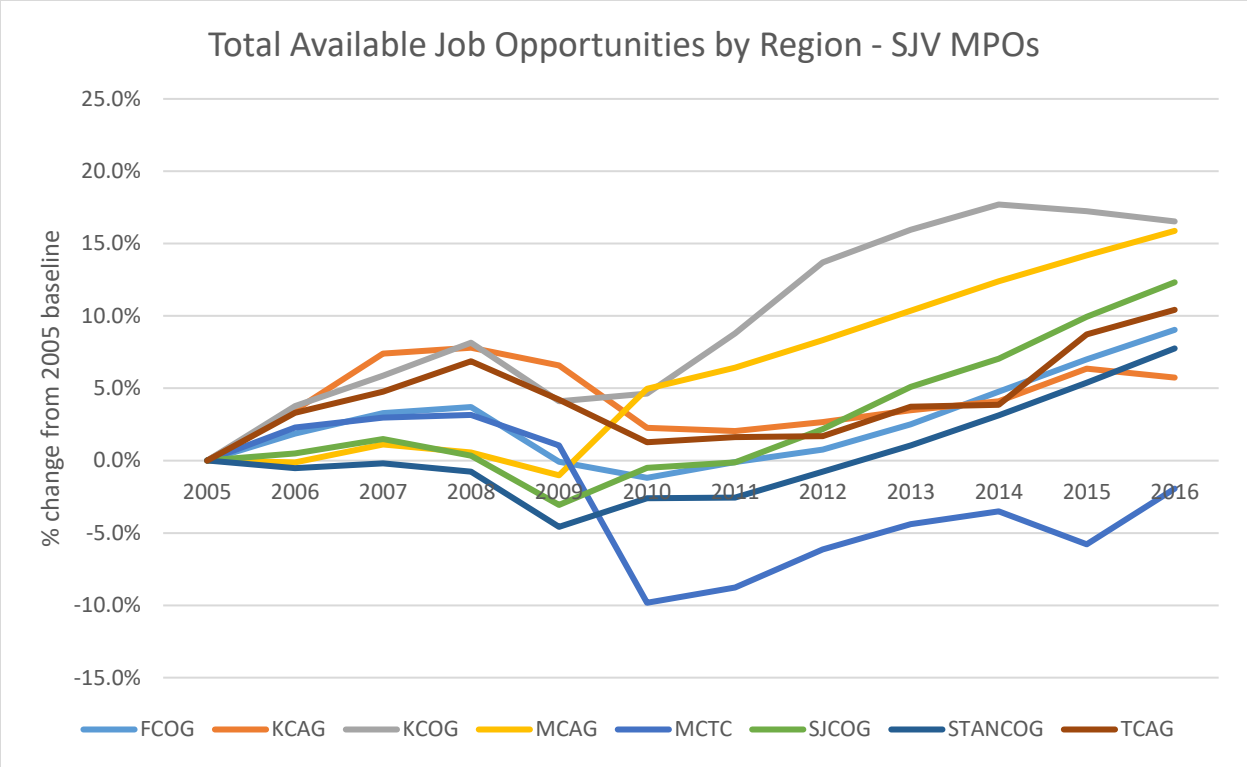
Data Source: California EDD

As shown in the figures, the temporal unemployment trends are similar in all MPOs – unemployment rates increased since 2008 and peaked between 2010 and 2011, and then start to drop afterwards. Within the Big 4 MPOs, MTC had the lowest unemployment rate; within the SJV MPOs, KCOG had the lowest unemployment rate during the recession period (i.e., 2008-2012), however the unemployment in the KCOG region did not drop in recent years as other SJV MPOs. Baseline unemployment rates in the remaining MPOs vary greatly, in which SLOCOG and SBCAG have significantly lower unemployment rates than other MPOs, especially SRTA, suggesting that spatial variation should not be neglected.

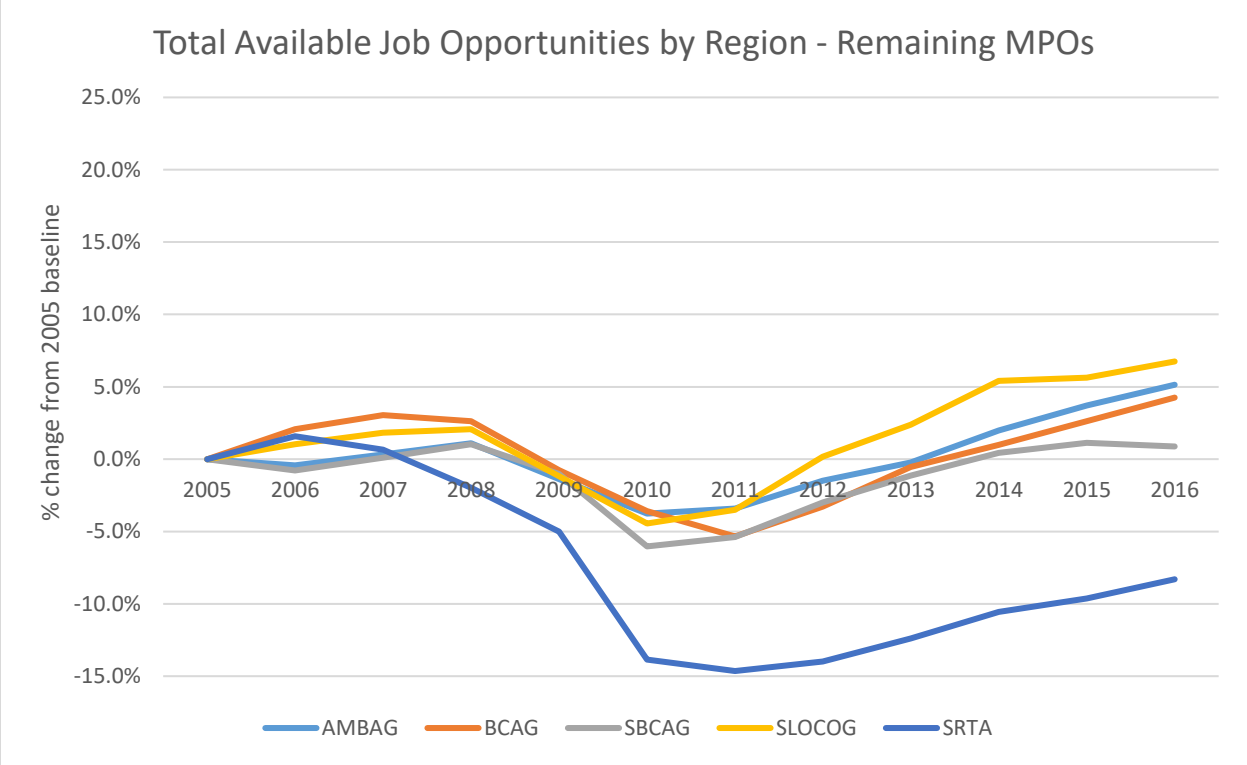
In addition to unemployment rates, this report also analyzed the trend in total available job opportunities in the MPOs. The following figures show the percentage change in cumulative available job opportunities compared to 2005 in the Big 4, SJV, and remaining MPOs. MTC has the greatest job increase rate since 2005, followed by SJV MPOs such as KCOG, MCAG, SJCOG, and TCAG. Current total available jobs in MCTC and SRTA have decreased since 2005.



Data Source: California EDD, DOF



Data Source: California EDD, DOF

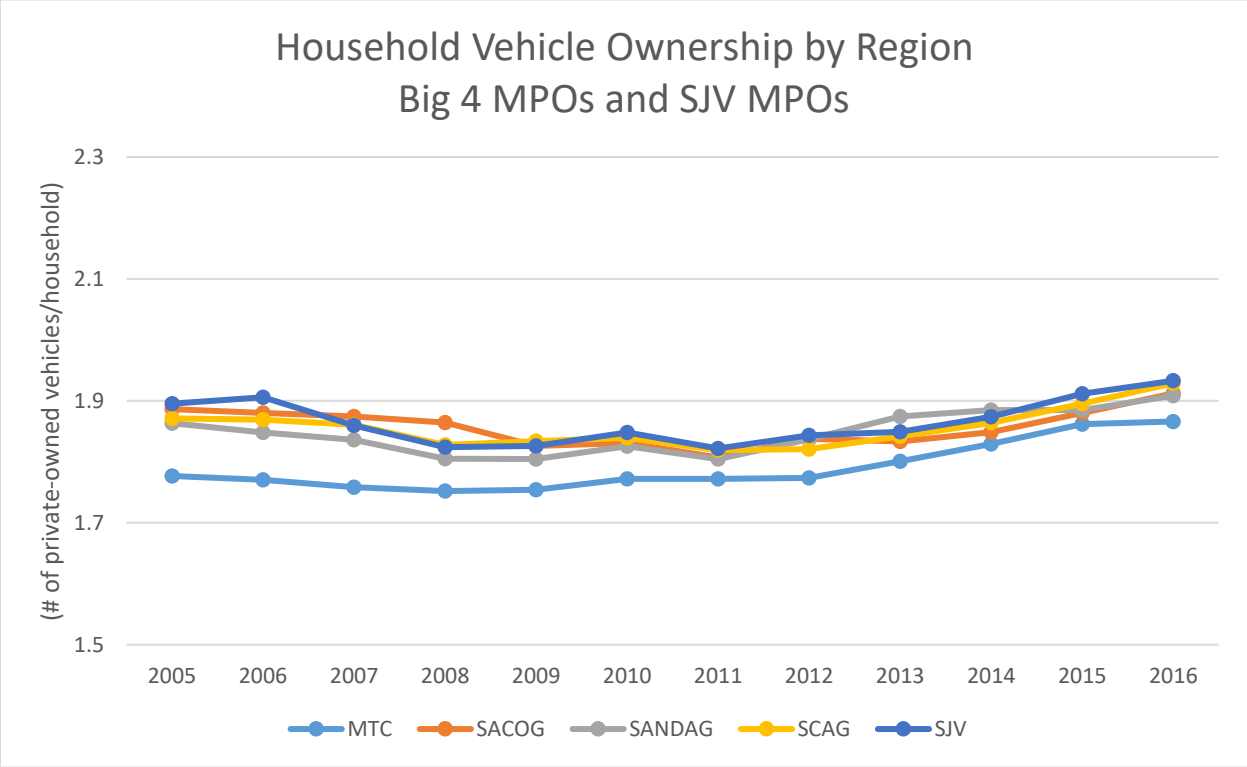


Data Source: California EDD, DOF

Vehicle Ownership

CARB staff analyzed the trend in household vehicle ownership by MPO from 2005 to 2016. For this indicator, CARB is reporting the average number of private vehicles owned by each household in each MPO, which is the total number of private-owned vehicles divided by the number of households in a given MPO. Total county-level private-owned vehicle data were obtained from the American Census Survey (ACS) 1-year reports from 2005 to 2016. MPO household numbers from 2005 to 2017 were obtained from DOF (http://www.dof.ca.gov/Forecasting/Demographics/Estimates/).

Vehicle ownership trends are similar across the different MPOs, specifically when comparing ownership rate trends in SCAG, MTC, SACOG, SANDAG, and the SJV MPOs. Average vehicle ownership declined from 2005 to 2012, and rebounded afterwards.

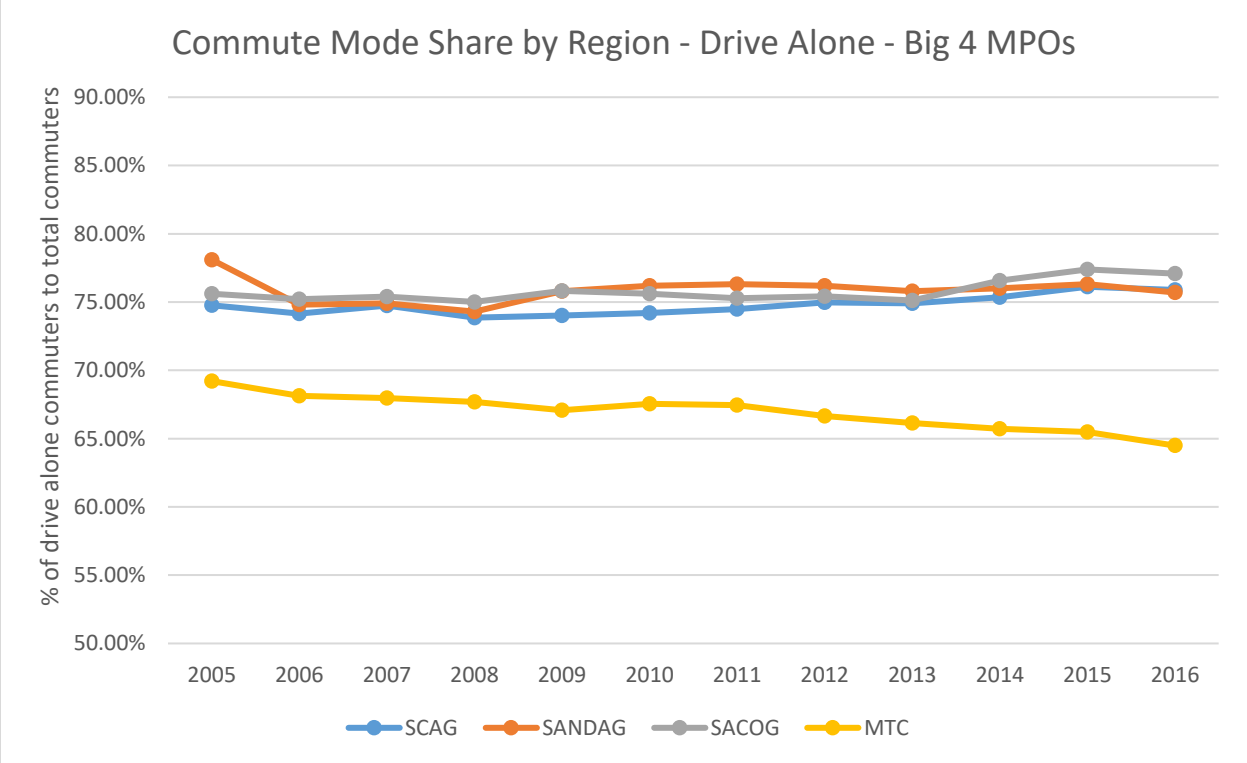


Data Source: ACS, DOF

Commute Mode Share

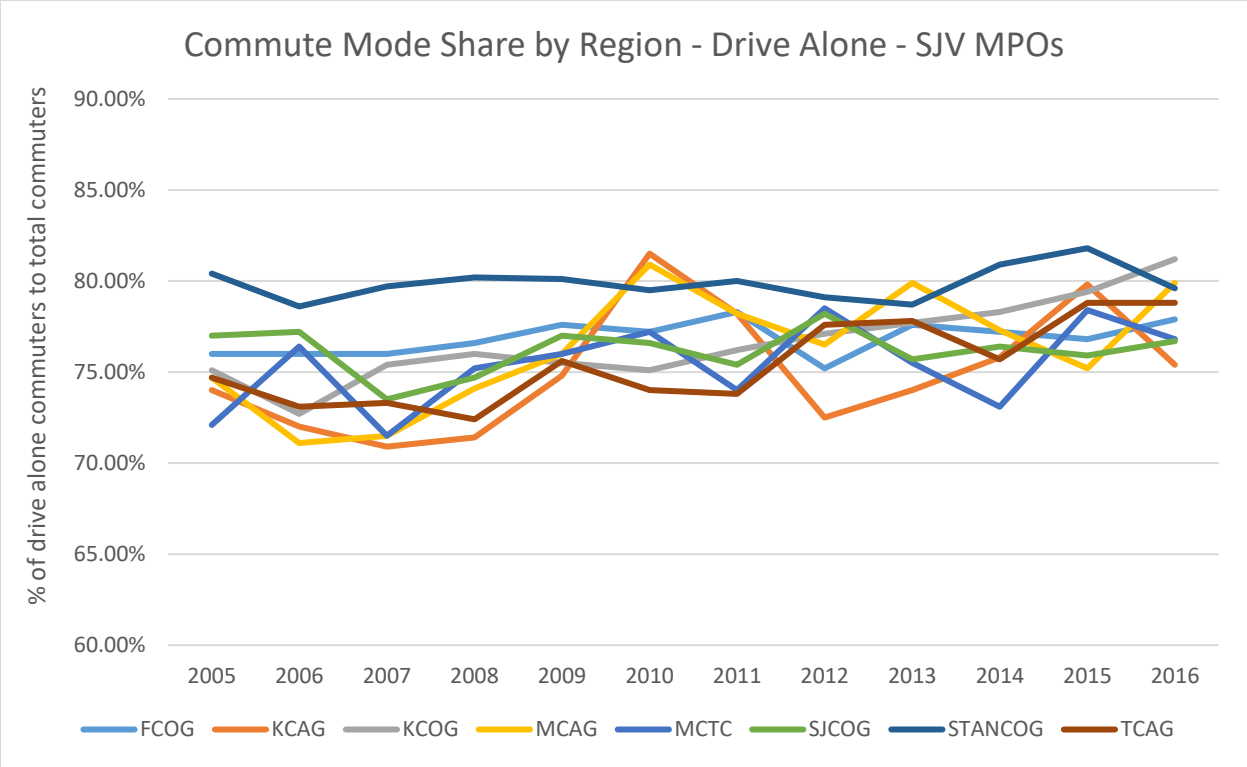
CARB staff analyzed commute mode share data by MPO for drive-alone, carpool, public transit, and active transportation modes from 2005 to 2016. For this indicator, CARB reports the percentages of mode-specific commuters to total commuters. Raw data were collected from American Census Survey (ACS) 1-year reports (i.e., county-level commute mode share and county-level commute population).

Analysis of the data trend shows that Californians continue to primarily drive alone to work. Across the state, 74 percent of commuters drove alone to work in both 2005 and 2016. The drive alone trends from 2005-2016 were almost flat in the SCAG, SACOG and SANDAG, with a slight rebound between 2015 and 2016. One notable exception is in the MTC region, where the drive alone rate has been decreasing continuously from 69 percent in 2005 to 64 percent in 2016.



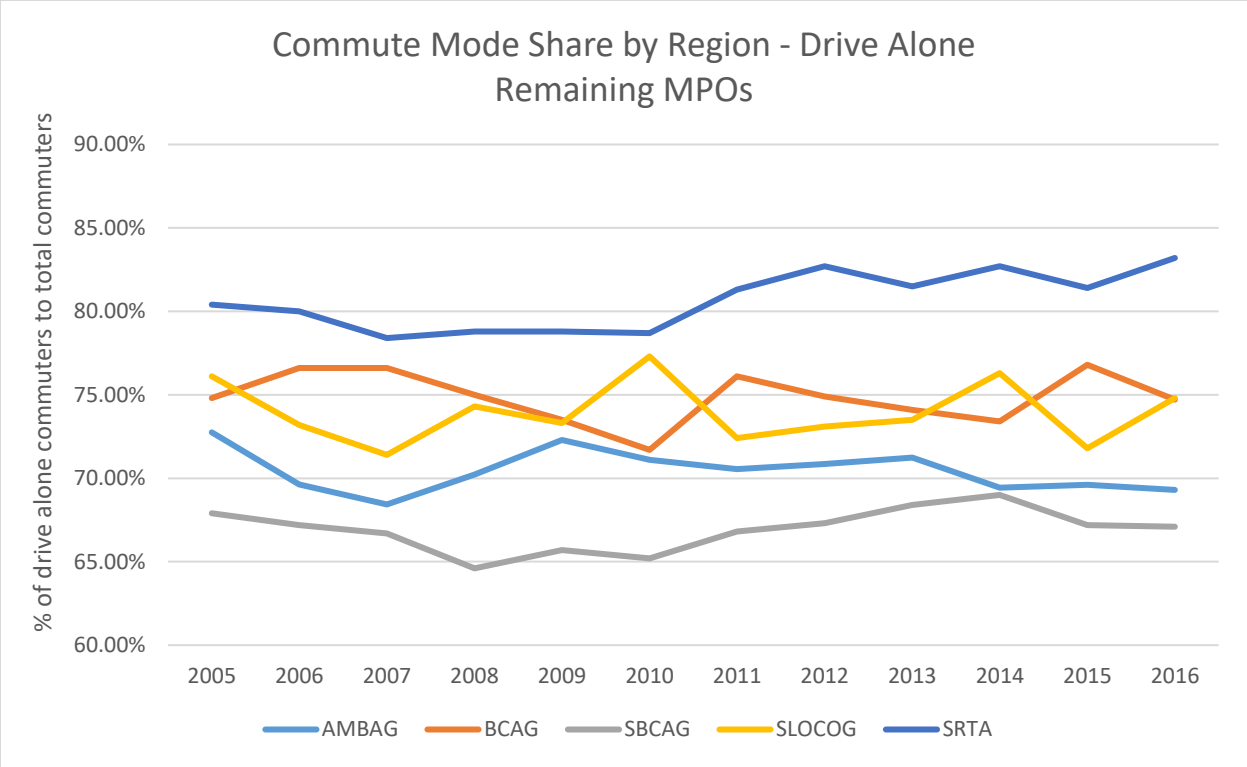
Data Source: ACS

The results for the SJV MPO regions and the remaining MPO regions are similar. In the SJV MPO regions, drive alone commuters account for 72 to 80 percent of all commuters in 2005 and 75 to 81 percent in 2016. In six of the eight SJV MPOs, the share of drive-alone mode commuters rose from 2005 to 2016, with the largest decline occurring in the StanCOG region, falling 0.8 percent (i.e., from 80.4 percent to 79.6 percent).



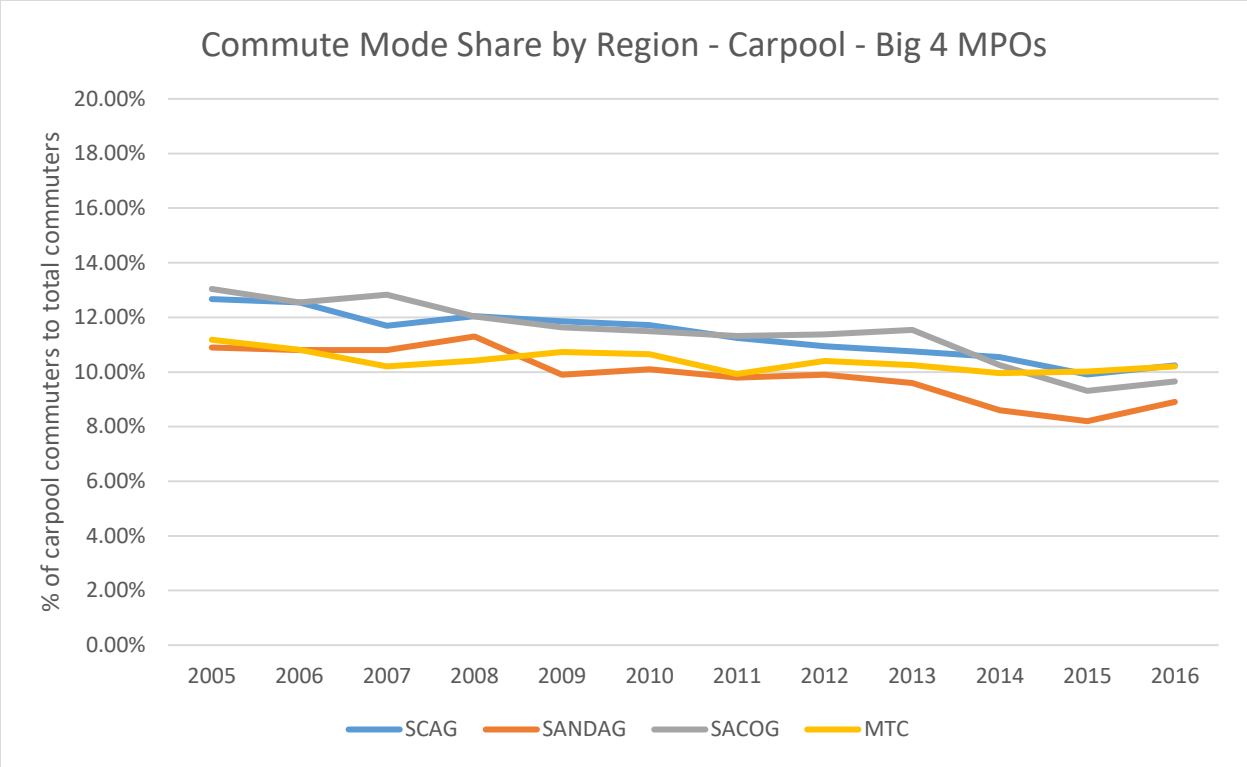
Data Source: ACS

In the remaining MPOs, the portion of commuters driving alone is slightly lower in 2016 than it was in 2005, in every region except for SRTA, although a clear downward trend is not necessarily evident. Both AMBAG and SBCAG have commute drive alone rates that are among the lowest in the state.

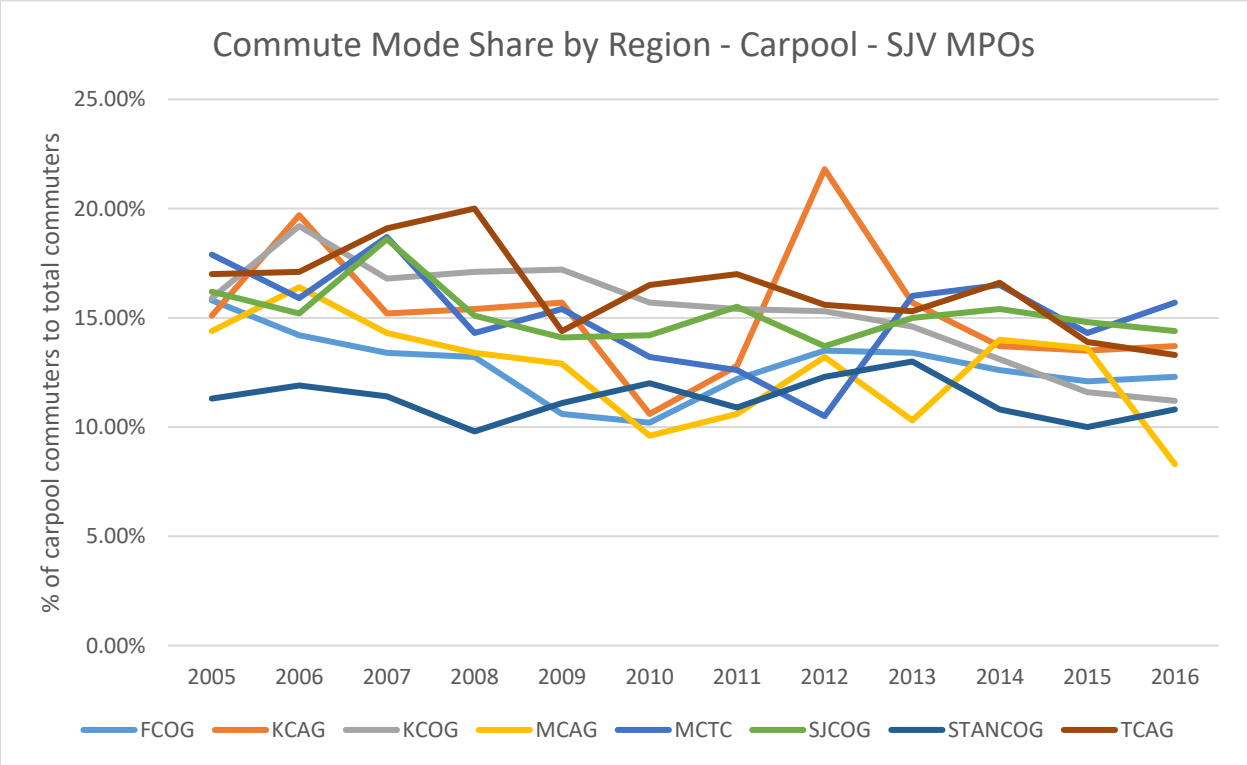


Data Source: ACS

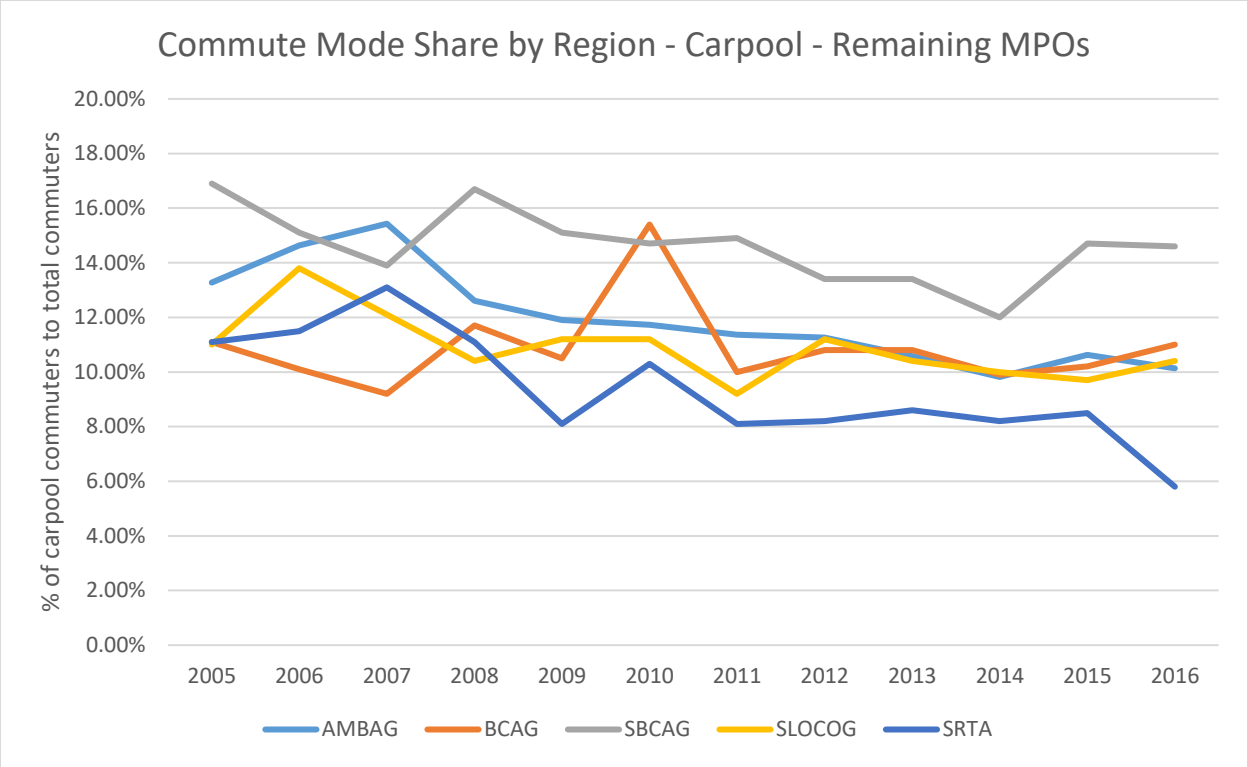
Commute mode share by carpool trends are shown in the following figures and indicate that carpooling rates are slightly decreasing over time in most MPO regions. Carpooling in SJV MPO regions was higher than in the Big 4 MPO regions, but fell in every county during the 2005-2016 period. Commute carpooling rates in the remaining MPO regions are similar to the SJV MPO regions, but also declining.



Data Source: ACS

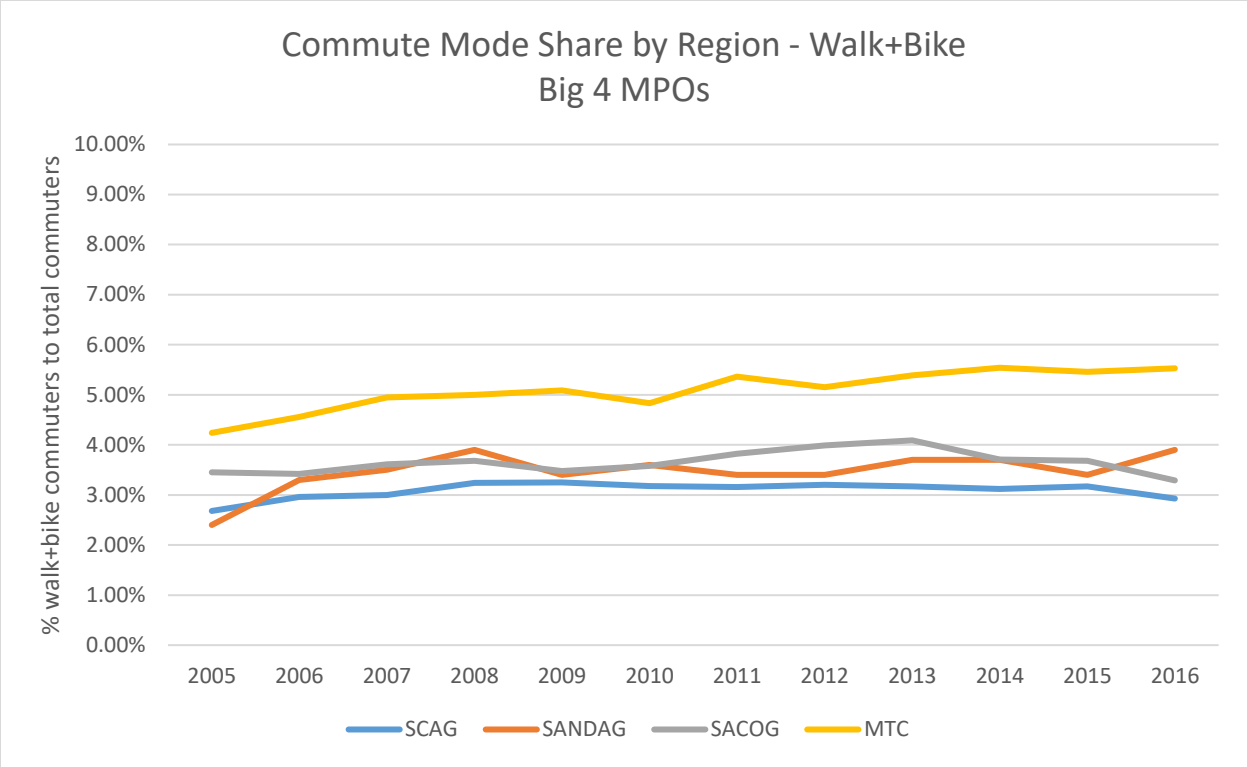


Data Source: ACS

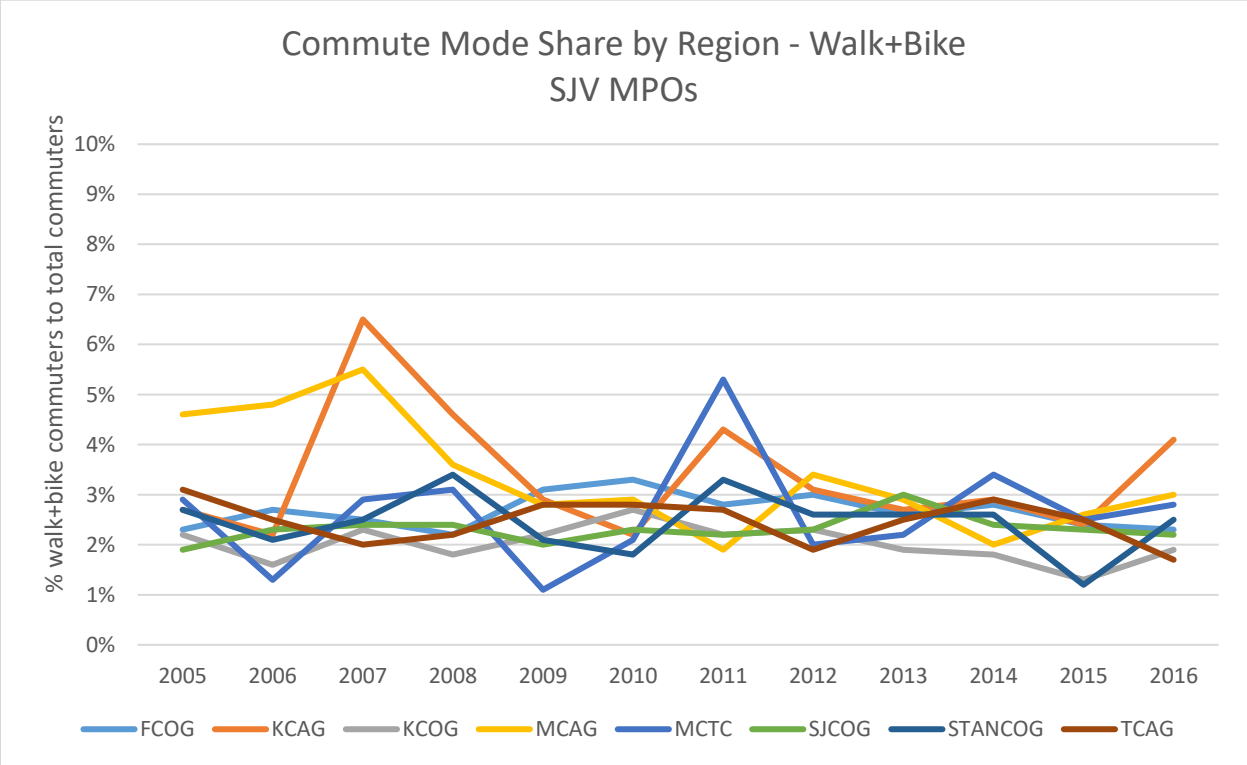


Data Source: ACS

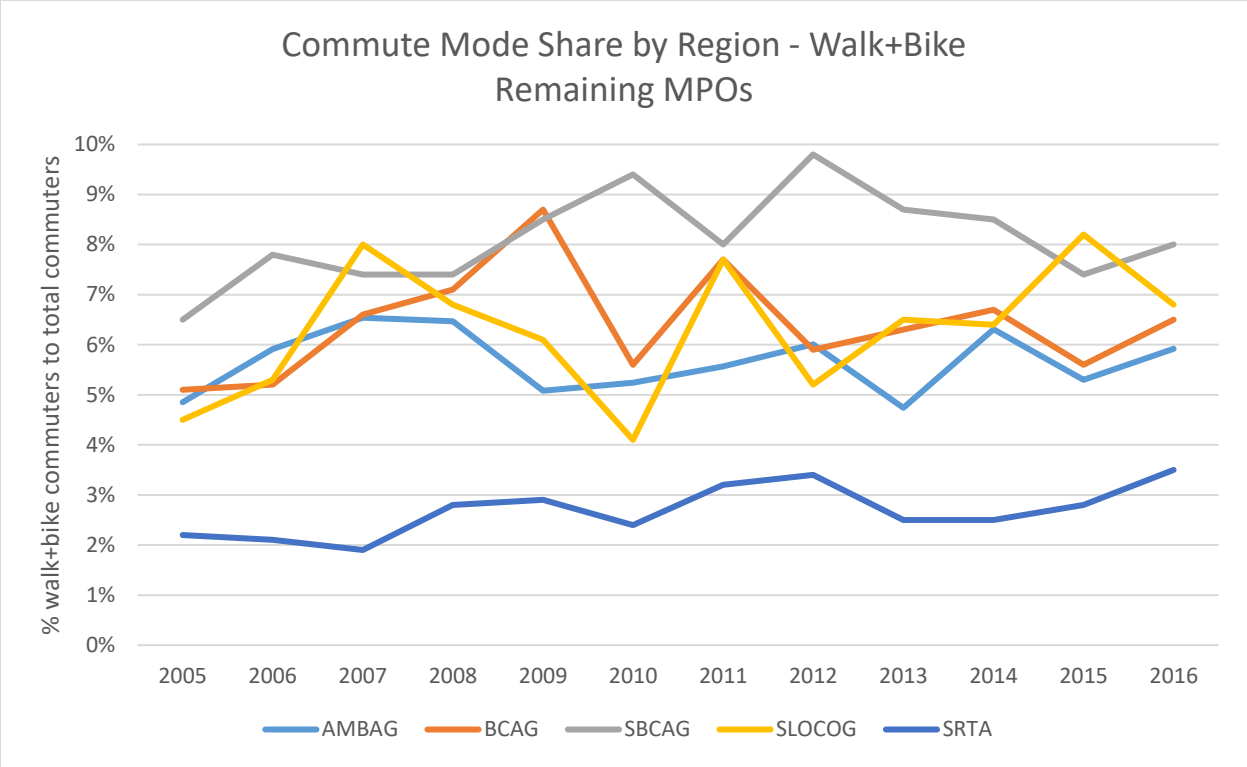
Commute mode share trends by walk and bike modes are shown in the following figures and indicate that only a small share of commuters use active transportation as their commute mode (i.e., 4.5 percent). The bike/walk trends from 2005-2016 were almost flat in the SCAG, SACOG and SANDAG regions (2.9 to 3.9 percent), with a slight recent increase in SANDAG. A continuous increasing trend of bike/walk mode share can be observed in MTC, which was 4.2 percent in 2005 and 5.5 percent in 2016. In the San Joaquin Valley, active transportation modes accounts for an even smaller share of commute trips, while in the remaining smaller MPOs, the active transportation mode share varies greatly. In SBCAG, SLOCOG, BCAG, and AMBAG regions the active transportation modes accounts for 6 percent or more of commute trips in 2016. In SRTA, although the share is only 3.5 percent in 2016, it has increased from 2.2 percent in 2005.



Data Source: ACS

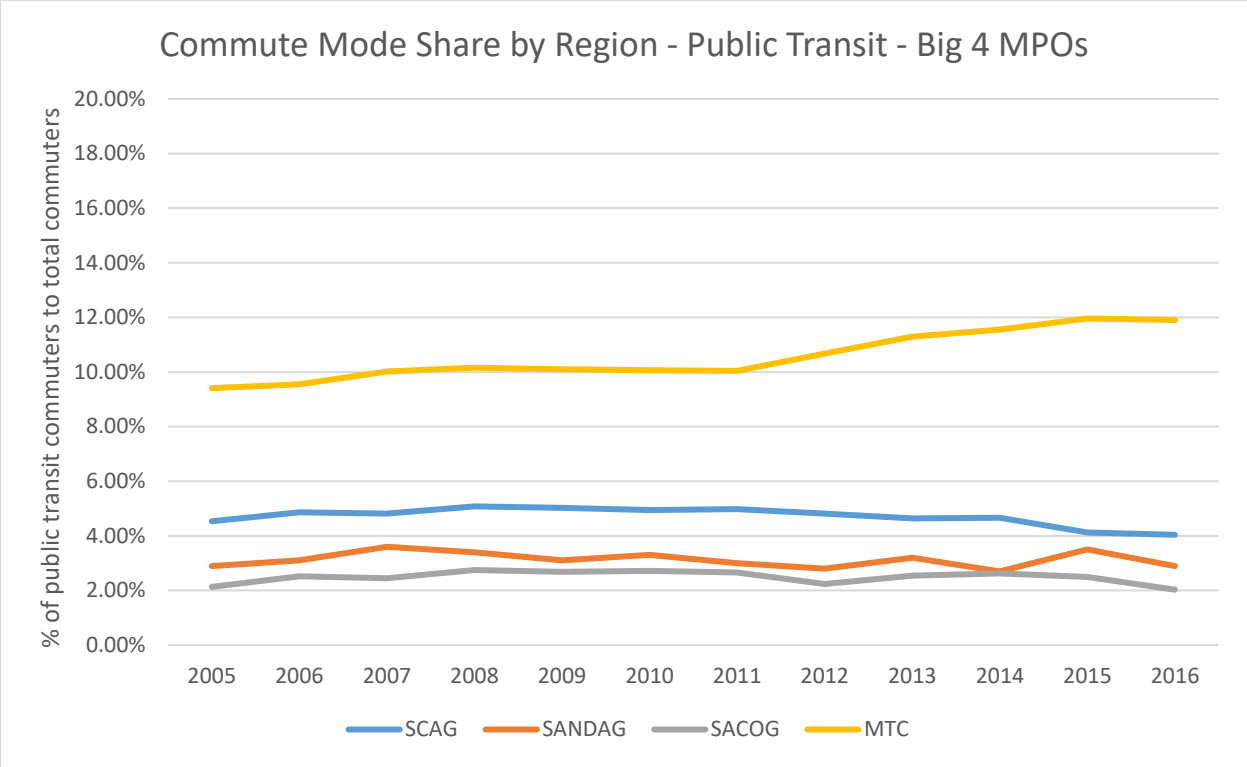


Data Source: ACS

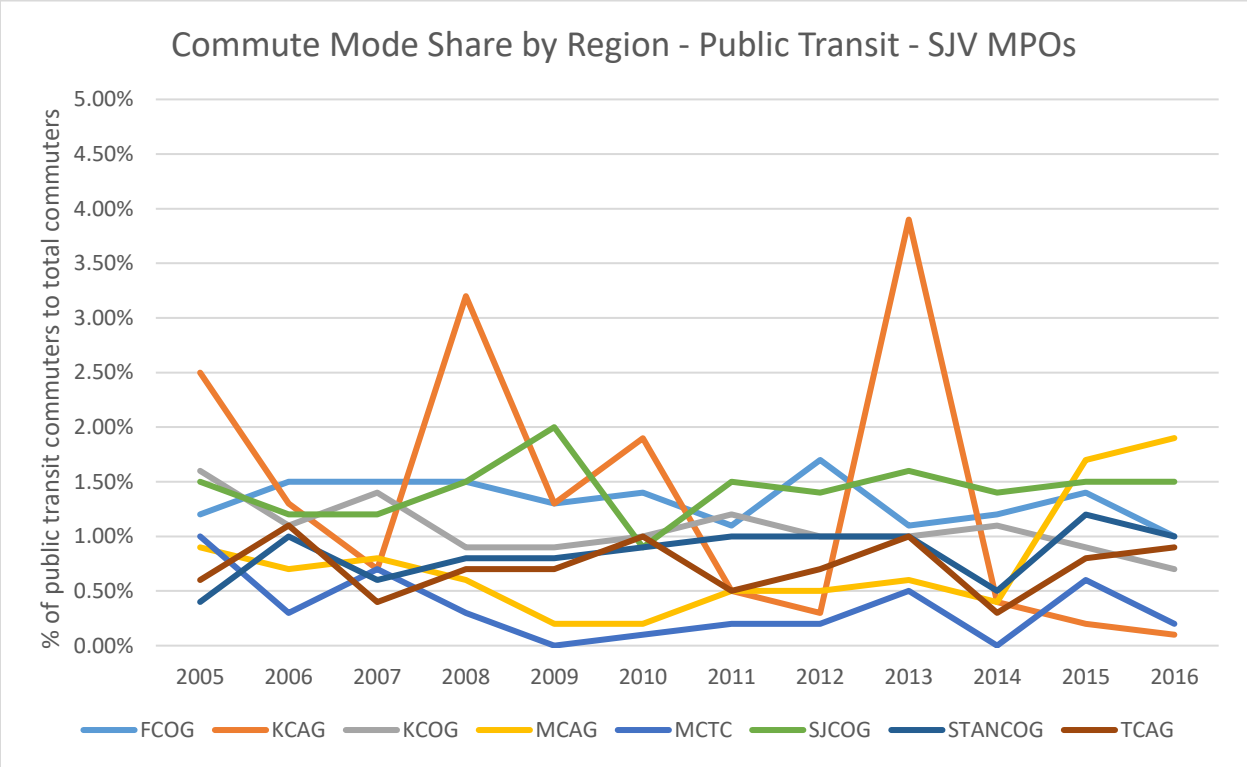


Data Source: ACS

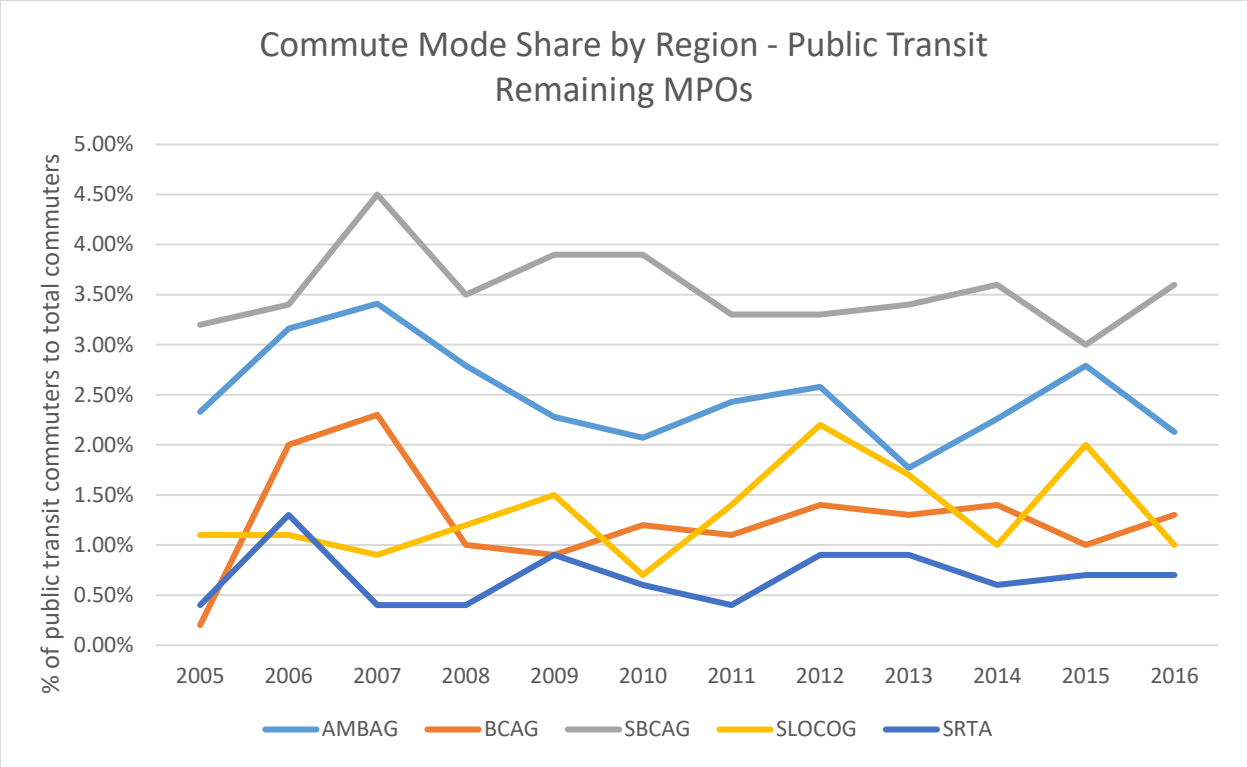
The commute mode share trends for public transit are shown in the following figures. In general, only the MTC region shows an observable increase in the share of public transit mode commuters during the reported time period. The use of public transit for commute trips decreased in other three Big 4 MPO regions. In the SJV MPO regions, the share of commuters using public transit has remained consistently lower than other regions in the state.



Data Source: ACS



Data Source: ACS



Data Source: ACS

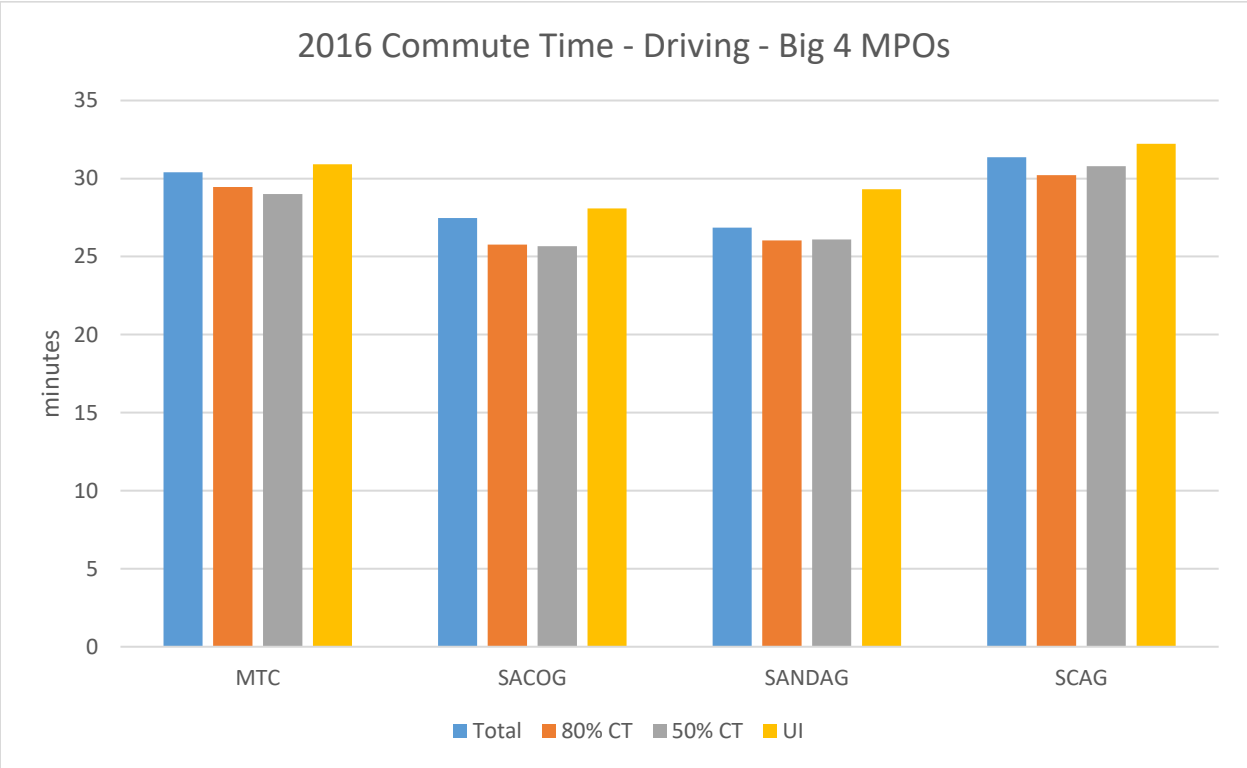
Commute Trip Travel Time by Mode, Including for Low-Income and Unincorporated Areas

CARB staff analyzed data on commute trip travel times for driving (including drive alone and carpool) and public transit modes in 2010 and 2016 in each region. CARB staff first calculated the commuter person-time by mode at the census tract level and then aggregated calculations to the MPO level. Total commuter person-time was then divided by the commuter population by mode in each MPO to get the average regional commute time by mode.

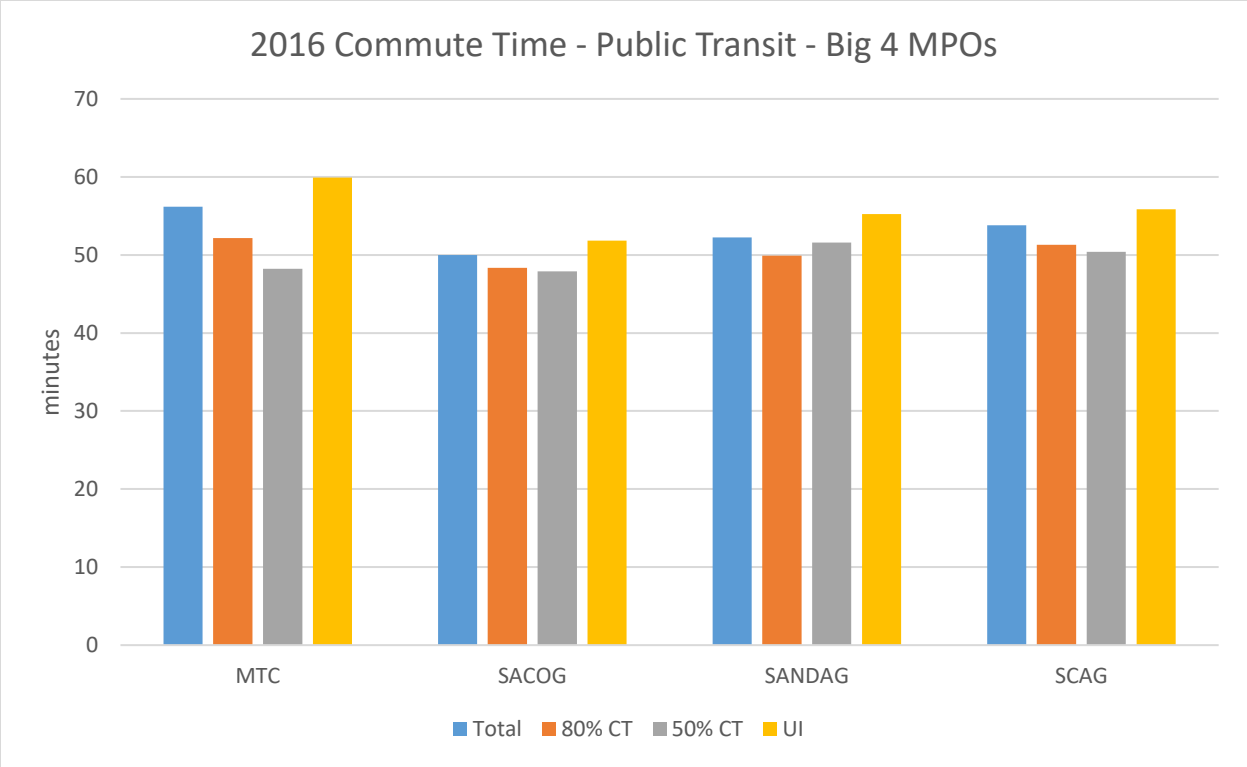
CARB staff used the same method to analyze the average commute trip travel time for driving (including drive alone and carpool) and public transit modes in 2010 and 2016 for select census tracts in each MPO-(1) census tracts whose median household income are below 80 percent of county median income – indicated in the charts as 80 percent CT; (2) census tracts whose median household income are below 50 percent of county median income – indicated in the charts as 50 percent CT; and (3) census tracts in an unincorporated area – indicated in the charts as UI. Commute mode, commute time and income data were obtained from ACS 5-yr at the census tract-level. Unincorporated area boundary information was obtained from the 2010 ACS boundary.

Regional commute times for driving (drive alone +carpool) and public transit modes for the above selected groups in each MPO are compared with the regional average commute time in 2016, as shown in the following figures.

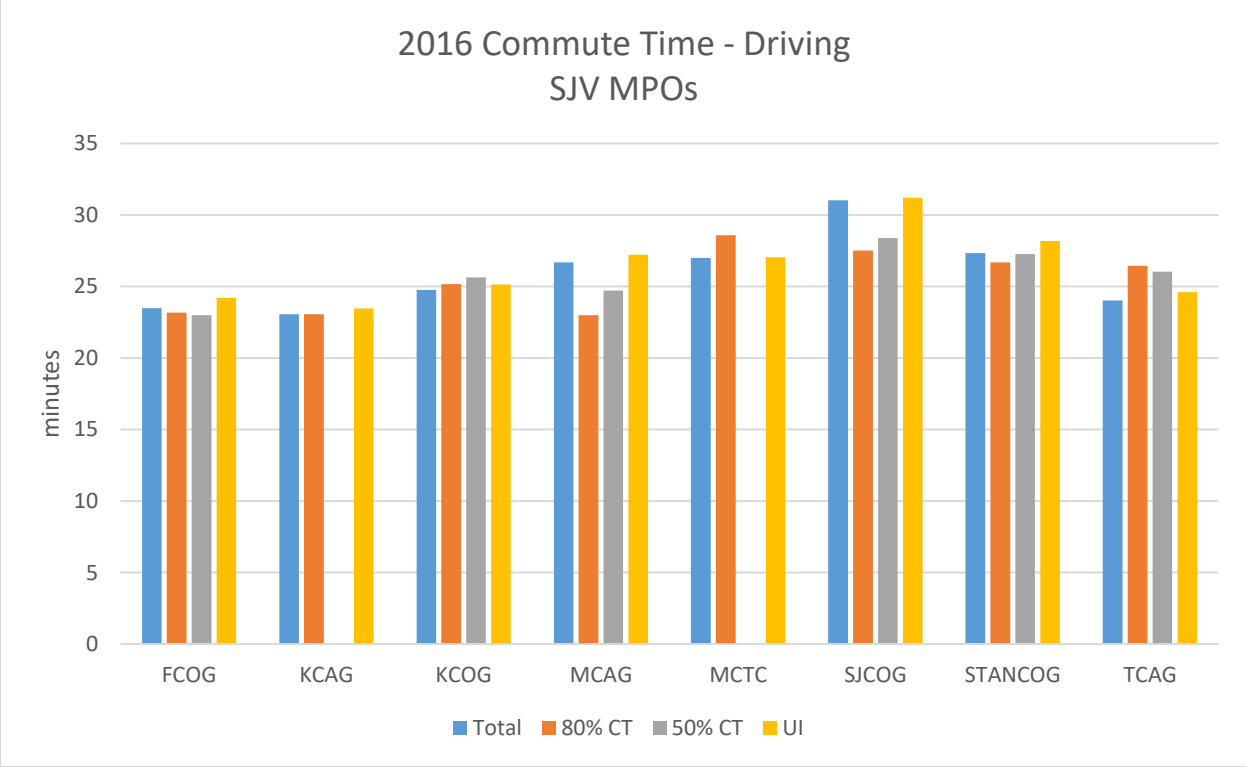
Data shows that commute trip travel time discrepancy exists between select communities and the regional average. When looking across all of the MPO regions, the Big 4 MPO regions have the lowest discrepancies between the select communities and the regional average. In most MPOs, census tracts that are in unincorporated areas have longer commute trip travel times. Census tracts whose median HH income is <50 percent of the county median income also have longer commute times in some MPOs. Commute trip travel time in census tracts whose median HH income is <80 percent of the county median income is not observed to be higher than the regional average.



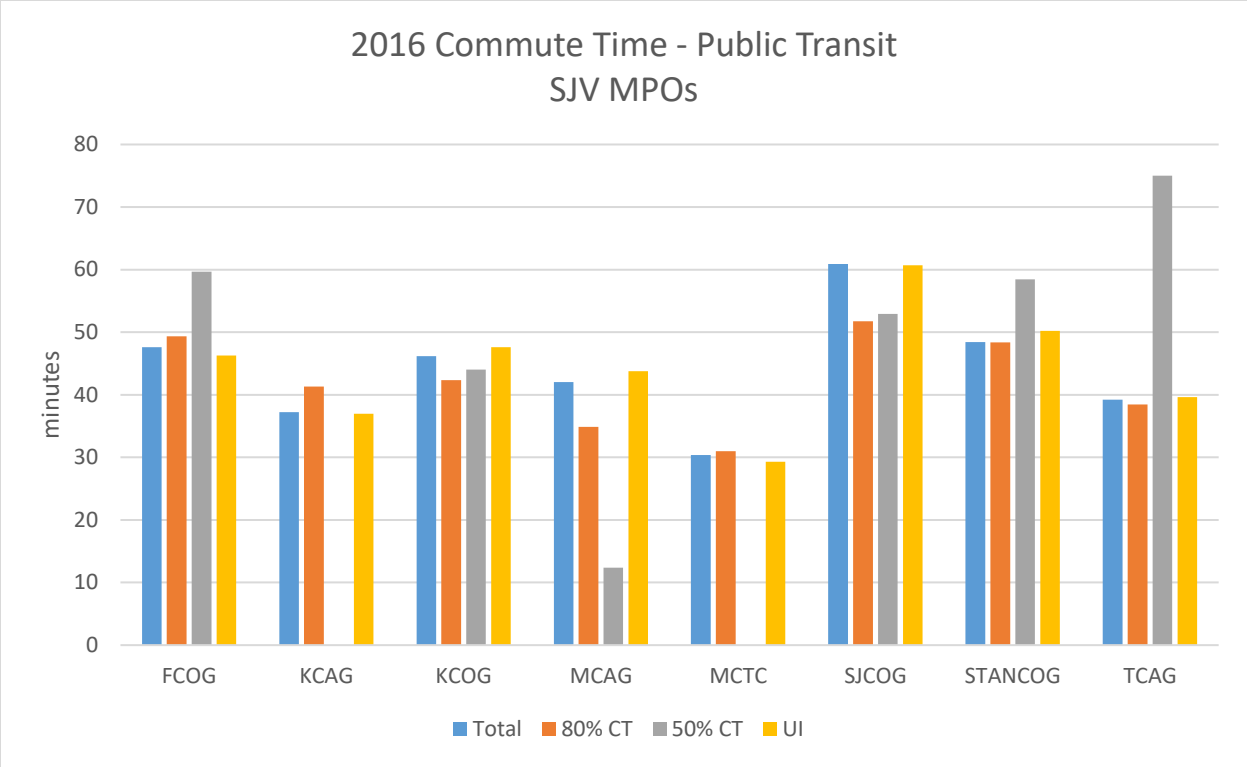
Data Source: ACS



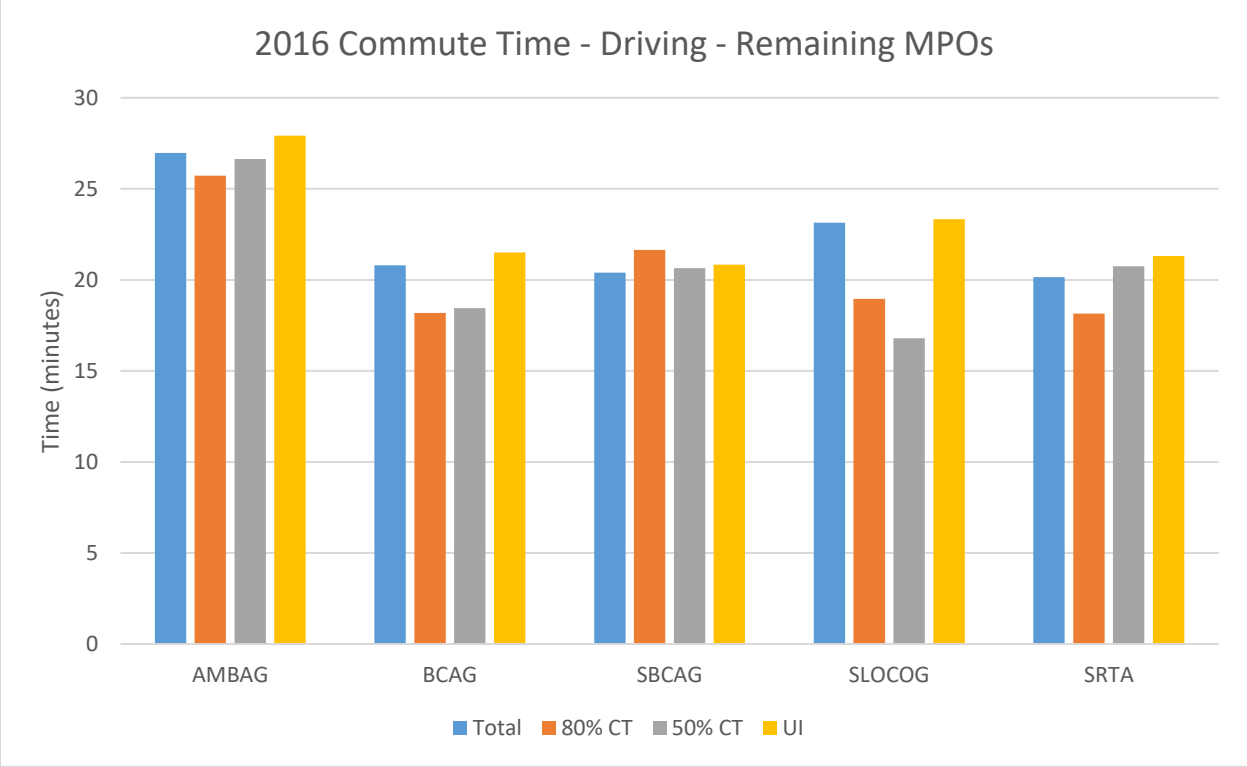
Data Source: ACS



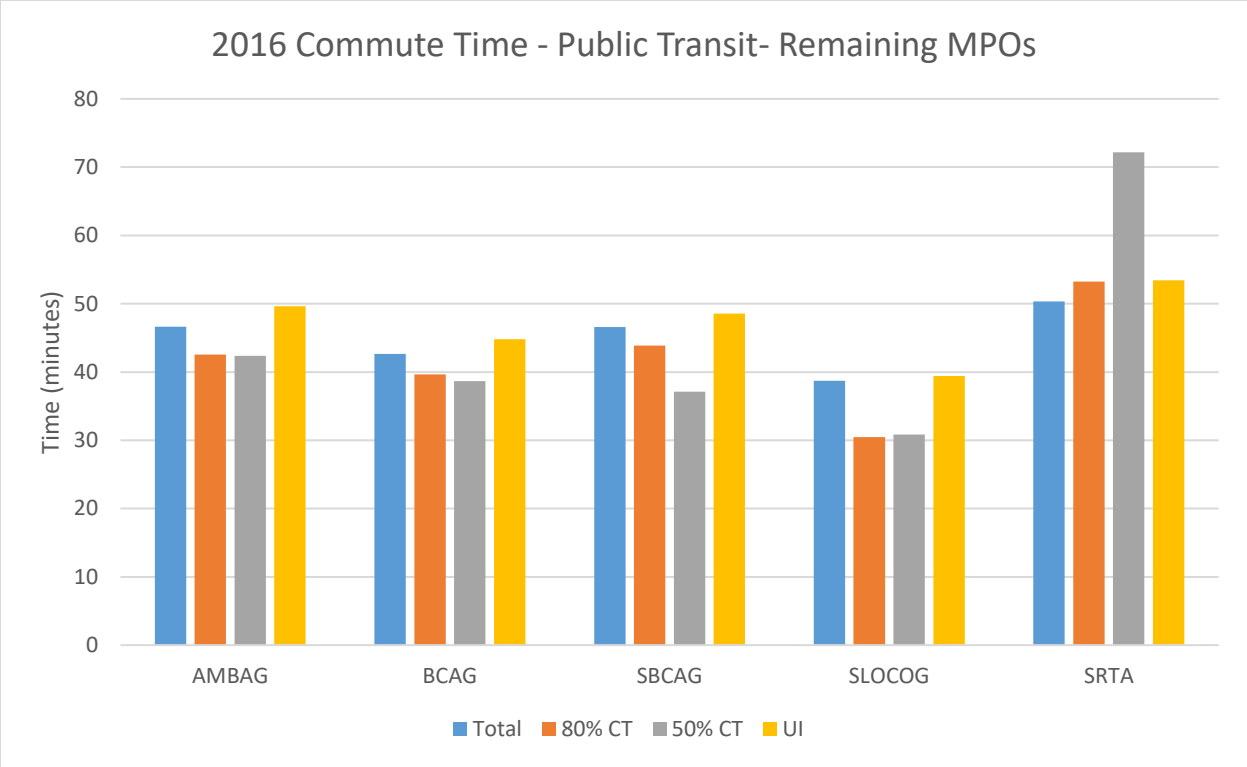
Data Source: ACS



Data Source: ACS



Data Source: ACS



Data Source: ACS

CARB staff also compared the commute trip travel time change from 2010 to 2016, and found that commute travel times are generally becoming longer in 2016.

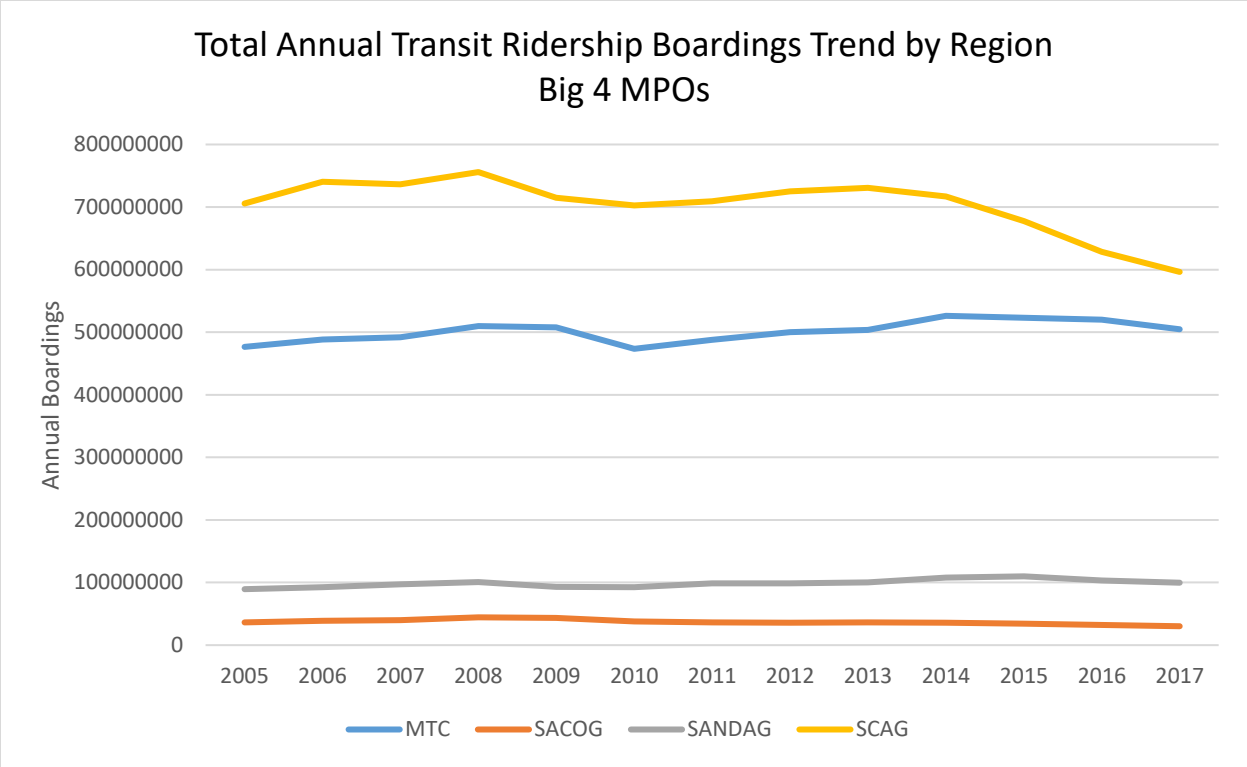
	Driving Mode				Public Transit			
MPO	Total	80% CT	50% CT	UI	Total	80% CT	50% CT	UI
AMBAG	0.8	0.9	1.5	0.7	1.6	-0.4	-4.3	4.0
BCAG	-0.3	0.6	4.7	-0.3	4.1	-1.7	-17.8	6.8
FCOG	0.7	0.9	0.2	0.8	7.6	9.9	20.4	7.4
KCAG	-0.1	-1.4		0.1	5.8	16.2		3.8
KCOG	0.5	-0.4	3.7	0.4	3.3	-5.7	-0.7	3.5
MCAG	0.4	0.1	2.8	0.2	11.4	7.7		13.2
MCTC	-0.6	-0.2		-0.6				1.4
MTC	2.3	2.4	2.5	2.3	3.5	4.5	3.7	3.0
SACOG	0.3	1.3	1.1	0.2	0.0	0.5	-1.0	-0.4
SANDAG	0.8	0.9	0.4	0.7	1.6	0.6	0.8	3.0
SBCAG	-0.3	-2.0	3.5	0.0	0.4	0.2	-2.2	1.3
SCAG	1.3	1.4	1.4	1.1	1.8	2.9	5.6	1.0
SJCOG	1.2	1.7	2.1	1.3	1.3	1.6		0.3
SLOCOG	1.4	1.0	2.4	1.5	-3.3	-5.0	8.5	-1.7
SRTA	0.3	-0.7	3.0	0.5				10.2
STANCOG	0.7	1.3	3.6	0.4	-2.7	5.8		-5.4
TCAG	1.2	1.4	-3.0	1.3	5.1	6.4		4.6

Note: Red positive numbers show commute trip travel time increases from 2010 to 2016; green negative numbers show commute trip travel time decreases from 2010 to 2016; a blank cell means no commuters fit into that category. The red/green shading represents the level of time change with darker shading indicating greater change from 2010 to 2016.

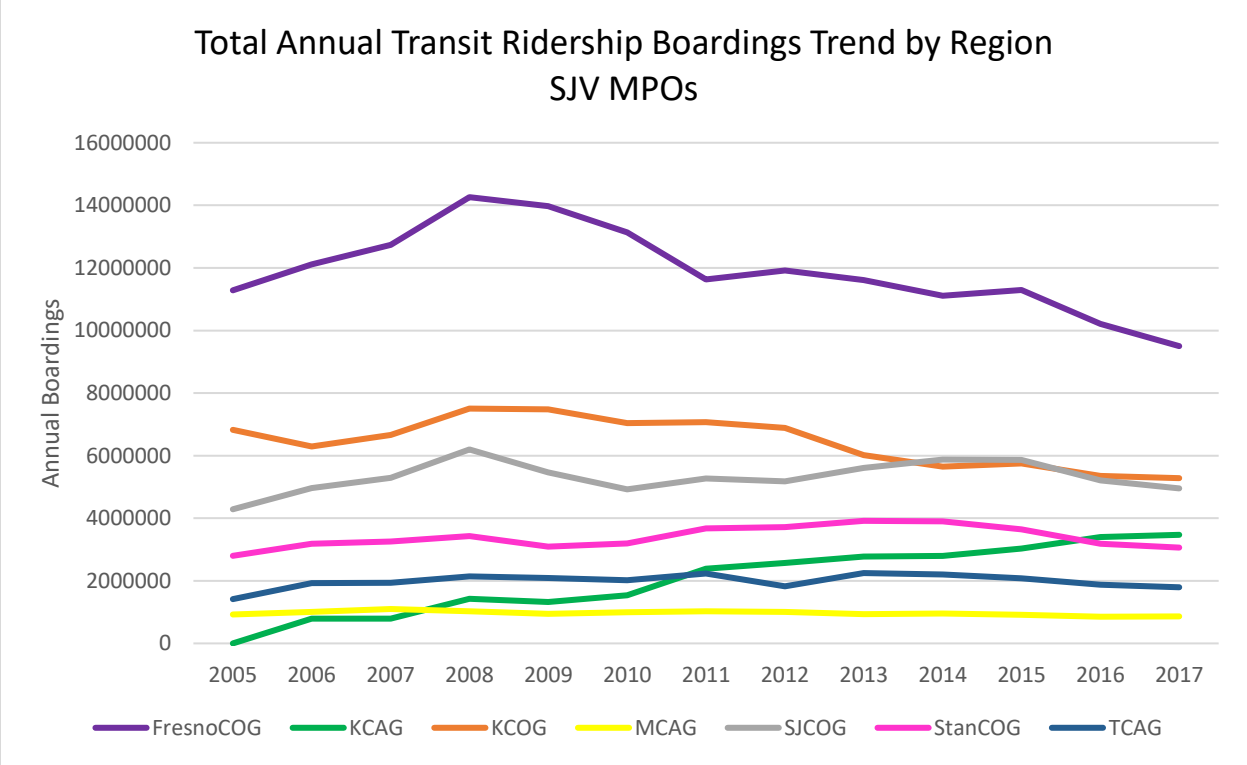
Transit Ridership Per Capita

The National Transit Database (NTD) publishes monthly transit boarding numbers (unlinked trips) reported by local transit agencies. CARB staff calculated the monthly and annual boarding numbers in every MPO based on this dataset from January 2005 to December 2017: https://www.transit.dot.gov/ntd/ntd-data. Total boarding numbers were further adjusted to annual per capital transit boarding.

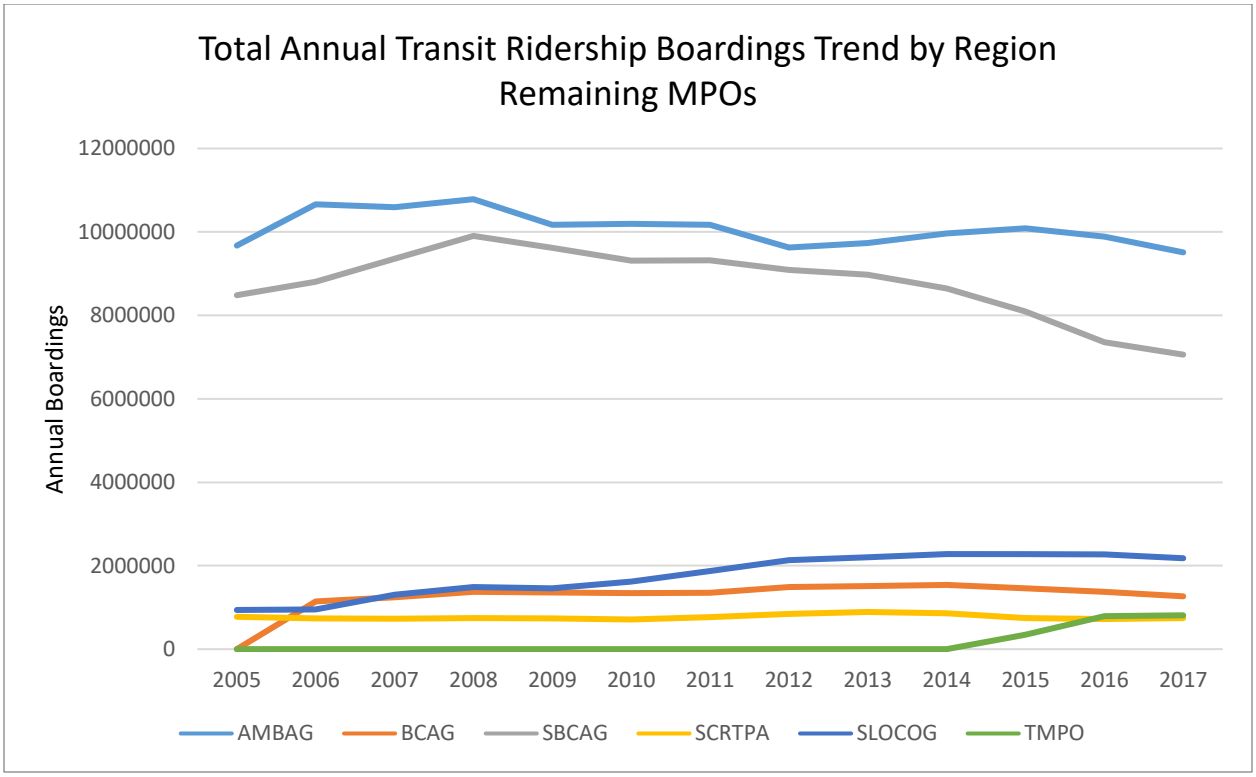
The total annual transit boarding trends by MPO are show in the following figures. As shown in the figures, the total transit ridership boarding numbers in most MPOs decreased over the reporting time period.



Data Source: NTD

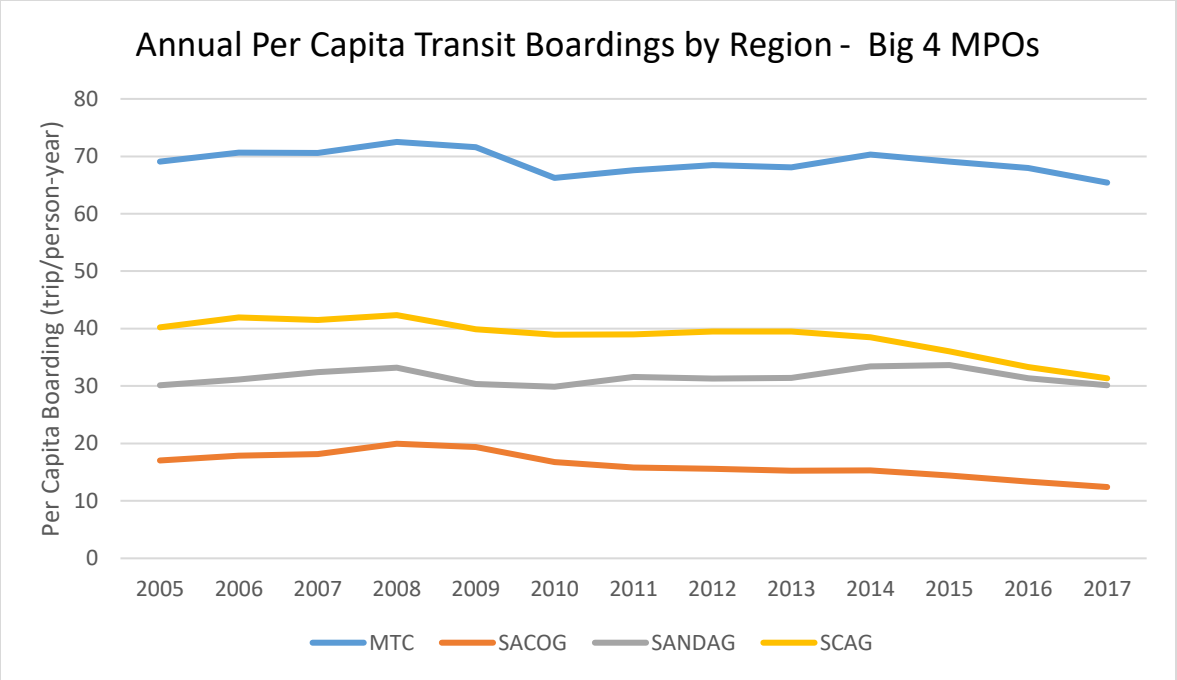


Data Source: NTD

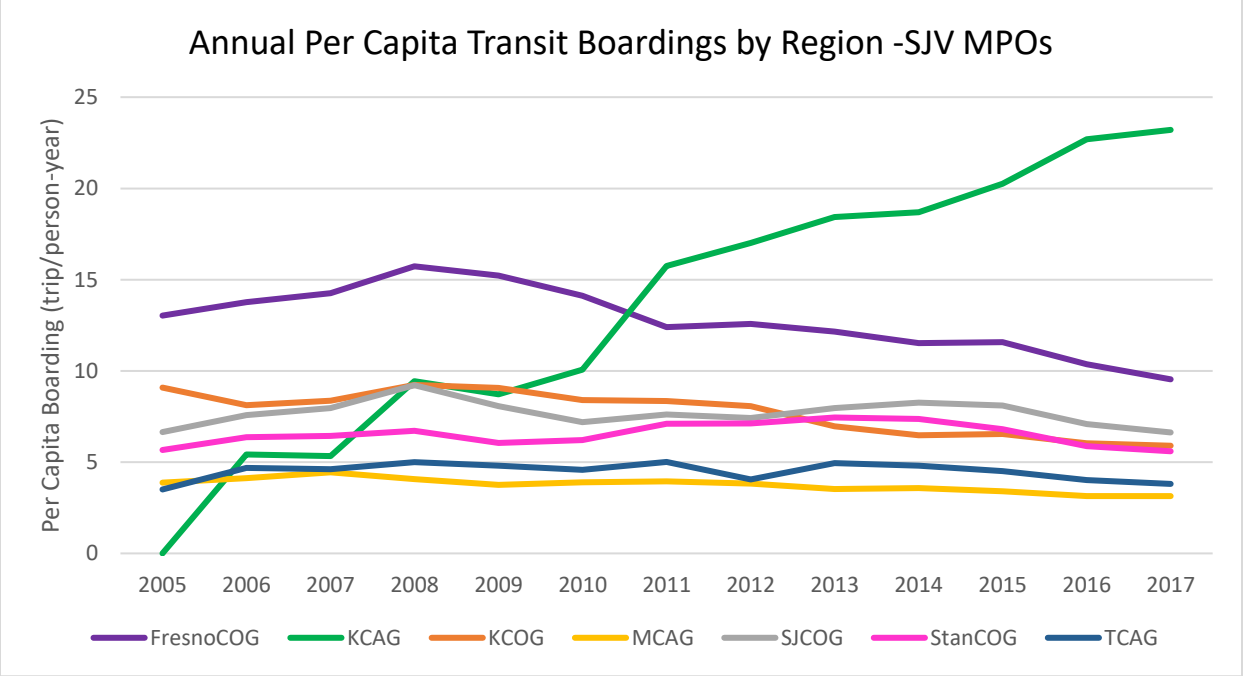


Data Source: NTD

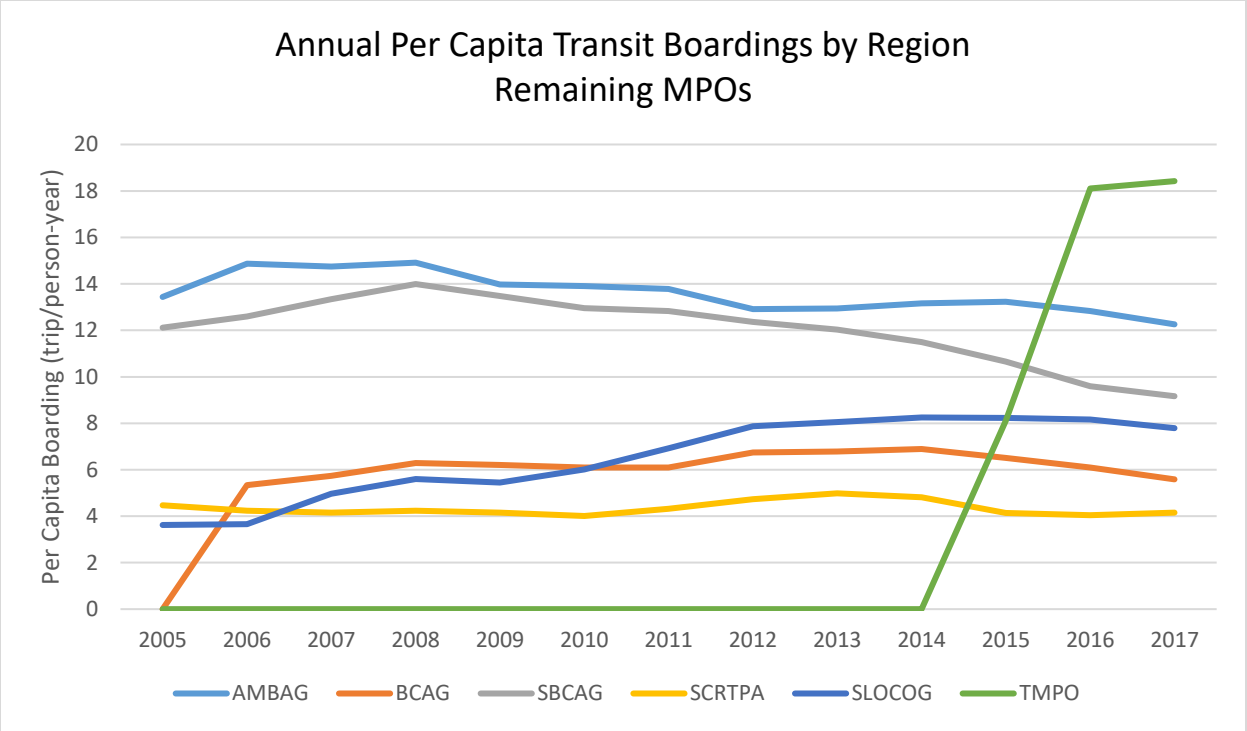
The per capita annual transit boarding trends by MPO are show in the following figures. As shown in the figures, the per capita boarding numbers in all of the Big 4 MPO regions, most of the SJV MPO regions, and the remaining MPO regions decreased over the tested time period. Annual per capita boardings have increased in KCAG and TMPO.



Data Source: NTD, DOF



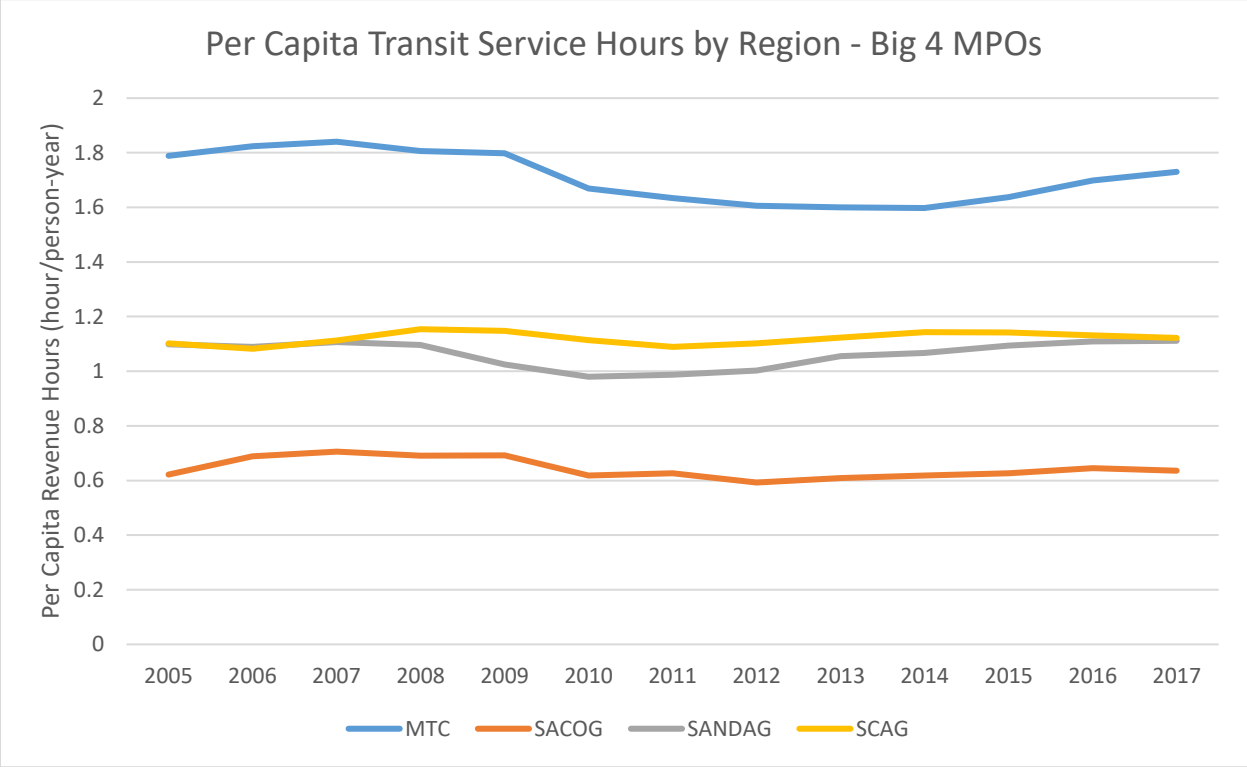
Data Source: NTD, DOF



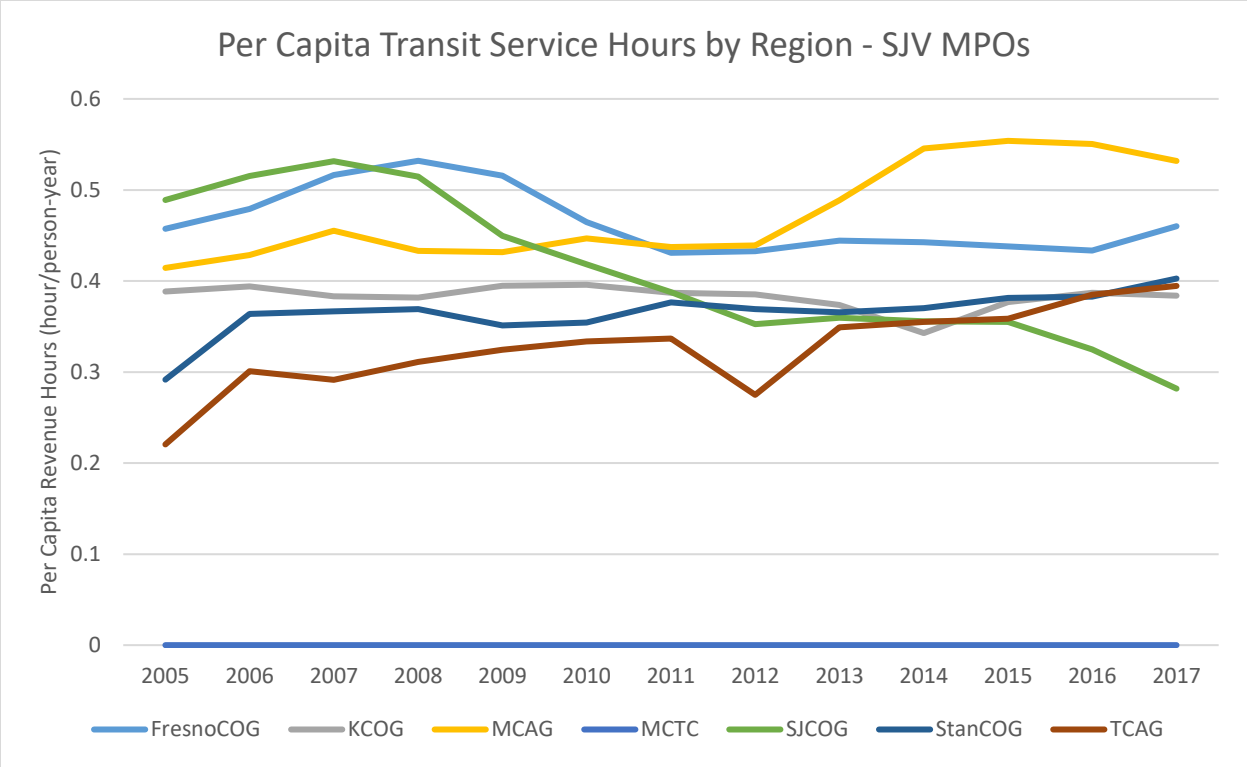
Data Source: NTD, DOF

Transit Service Hours Per Capita

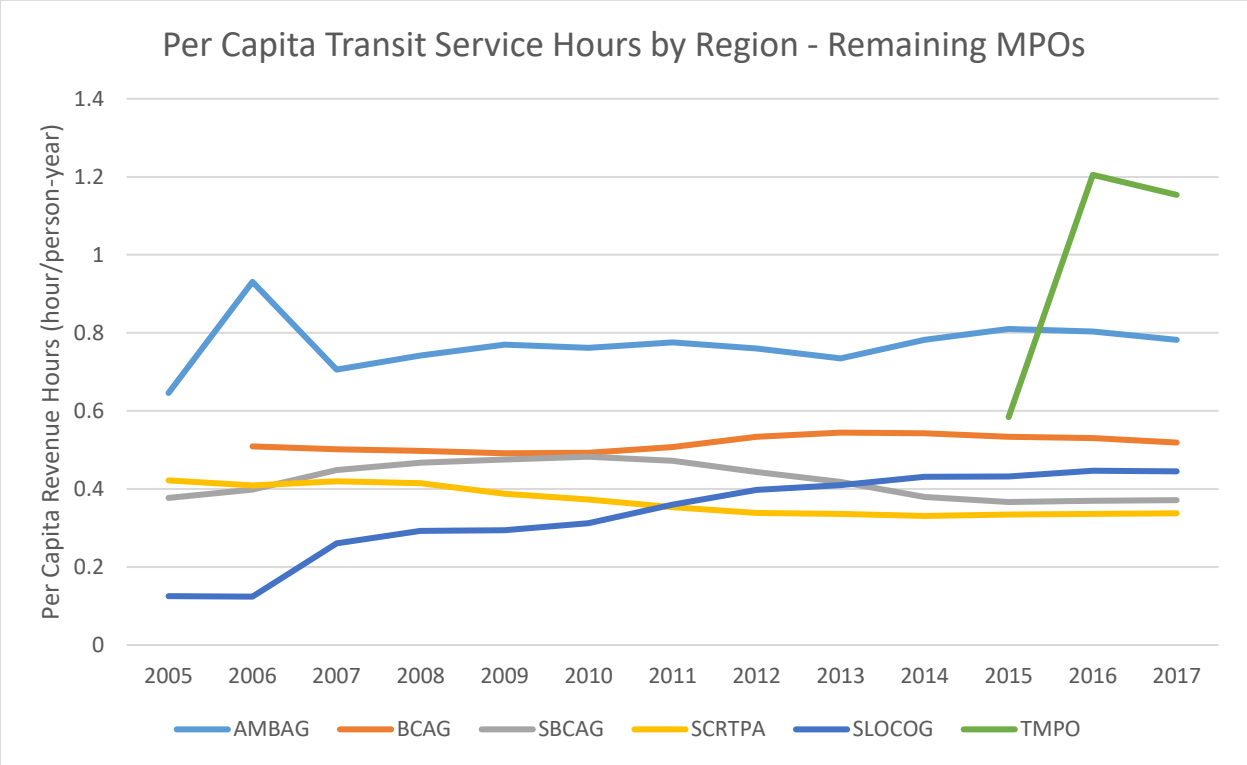
The National Transit Database (NTD) publishes monthly boarding numbers (unlinked trips) reported by local transit agencies. CARB staff calculated the monthly and annual revenue hours in every MPO based on this NTD dataset from January 2005 to December 2017: https://www.transit.dot.gov/ntd/ntd-data. The total transit service hours in each MPO were then adjusted to annual per capital transit service hours. In general, the service hour trend corresponds to the annual per capita transit boardings trends shown above. However, when transit service hours began to steady and/or increased starting in 2014, the per capita transit ridership boarding continued to decrease.



Data Source: NTD, DOF



Data Source: NTD, DOF



Data Source: NTD, DOF

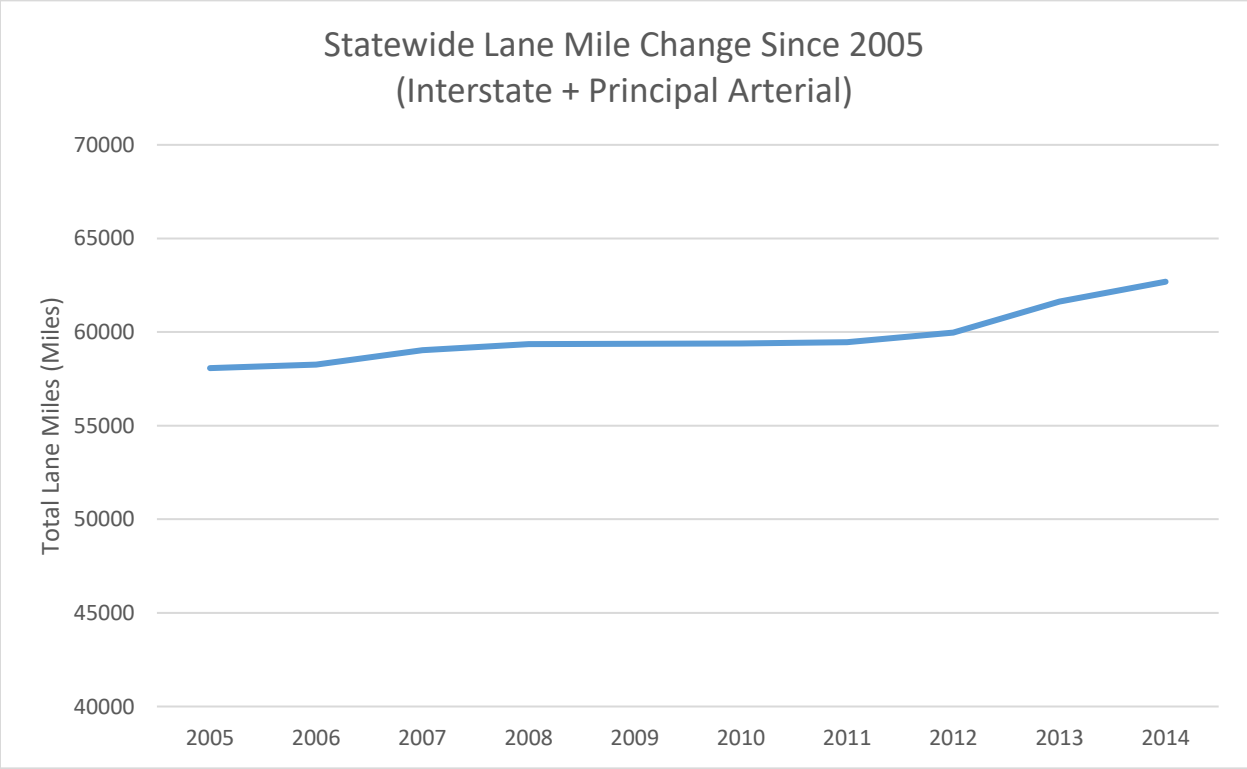
Lane Miles Built

The HPMS annual report provides lane mile information in California. CARB staff analyzed the total interstate and principal arterial road lane mile changes from 2005 to 2014 in California based on this data set. CARB staff also calculated the lane mile increase of interstate and principal arterial roads in each MPO from 2012 to 2014. Due to data availability, other years' lane mile data at the MPO level was not calculated.

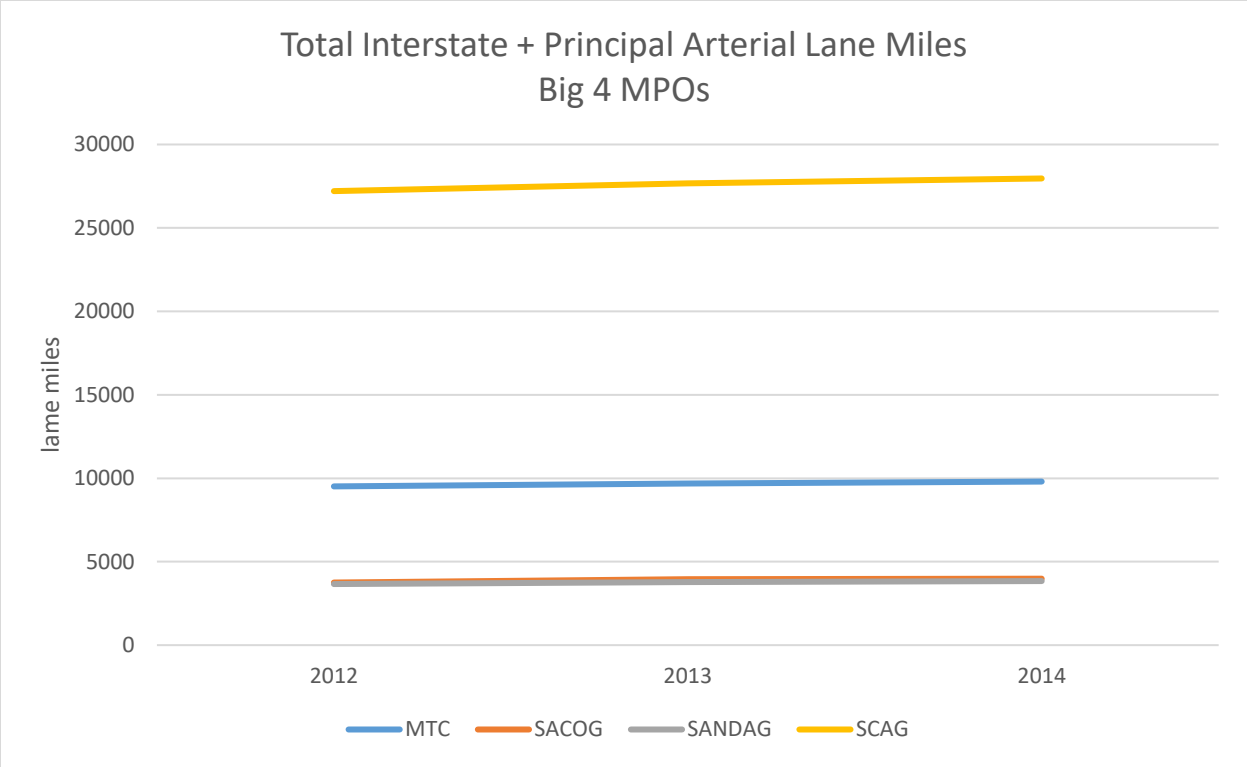
According to CARB staff's analysis, combined interstate and principal arterial lane miles have increase from 58,075 miles in 2005 to 62,691 miles in 2014, or 7.9 percent.

A lane-mile drop was observed in 2015, which is likely due to updates and changes to the HPMS methodology and system rather than on-the-ground changes in lane miles. Given this change, the lane mile data for 2015 and 2016 are not directly comparable to previous years.

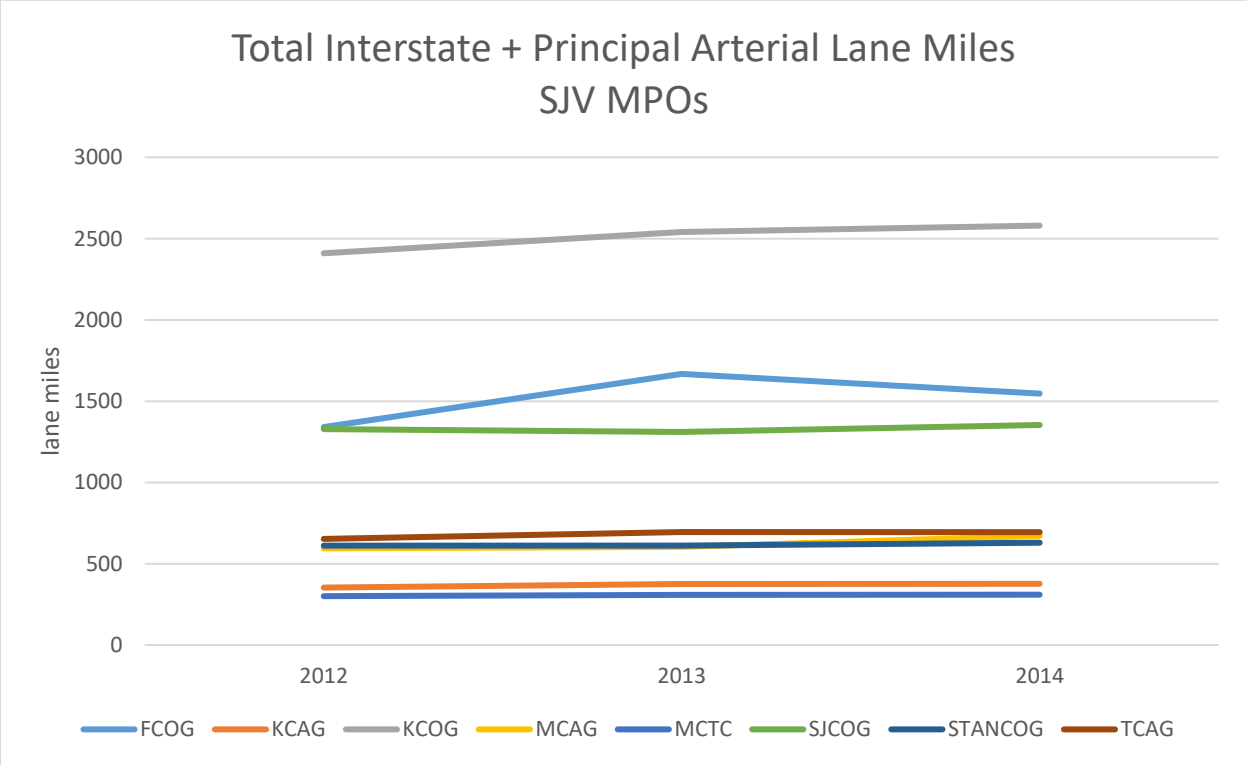
Looking at 2015 and 2016 alone, CARB staff calculated that the statewide lane miles increased from 2015 to 2016 by 0.4 percent, and the per capita lane miles decreased by 0.3 percent.



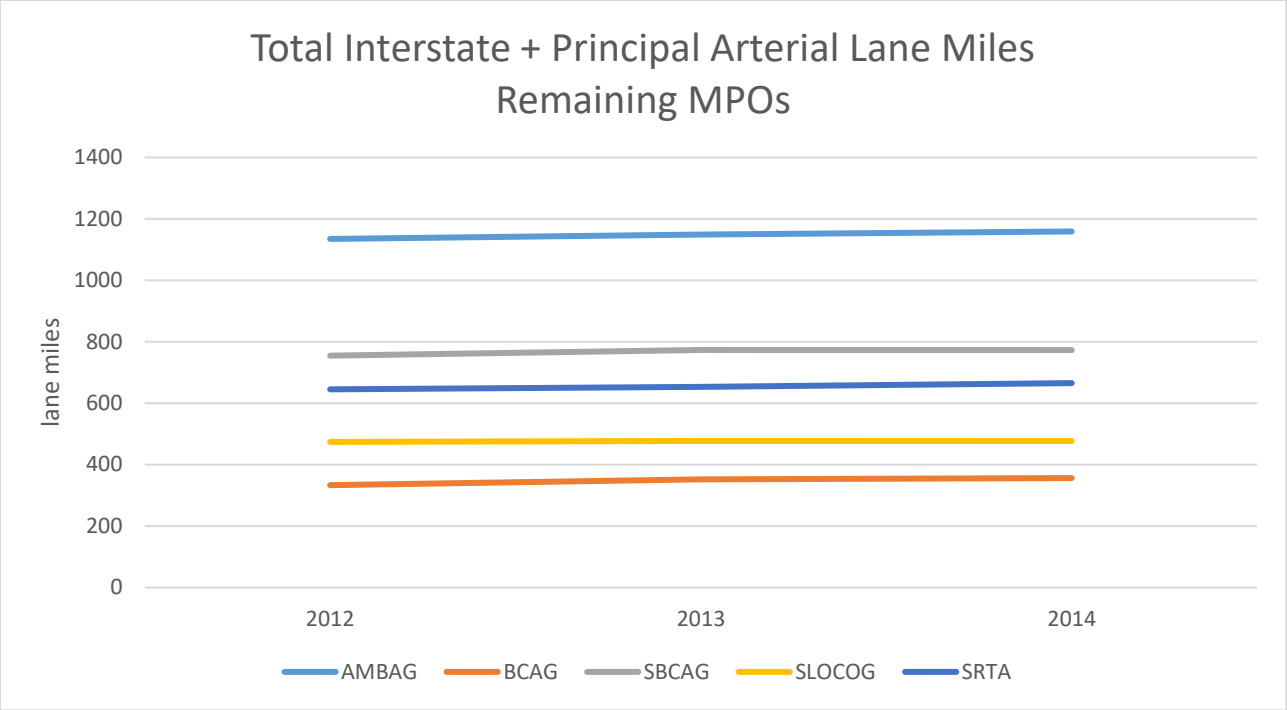
Data Source: HPMS



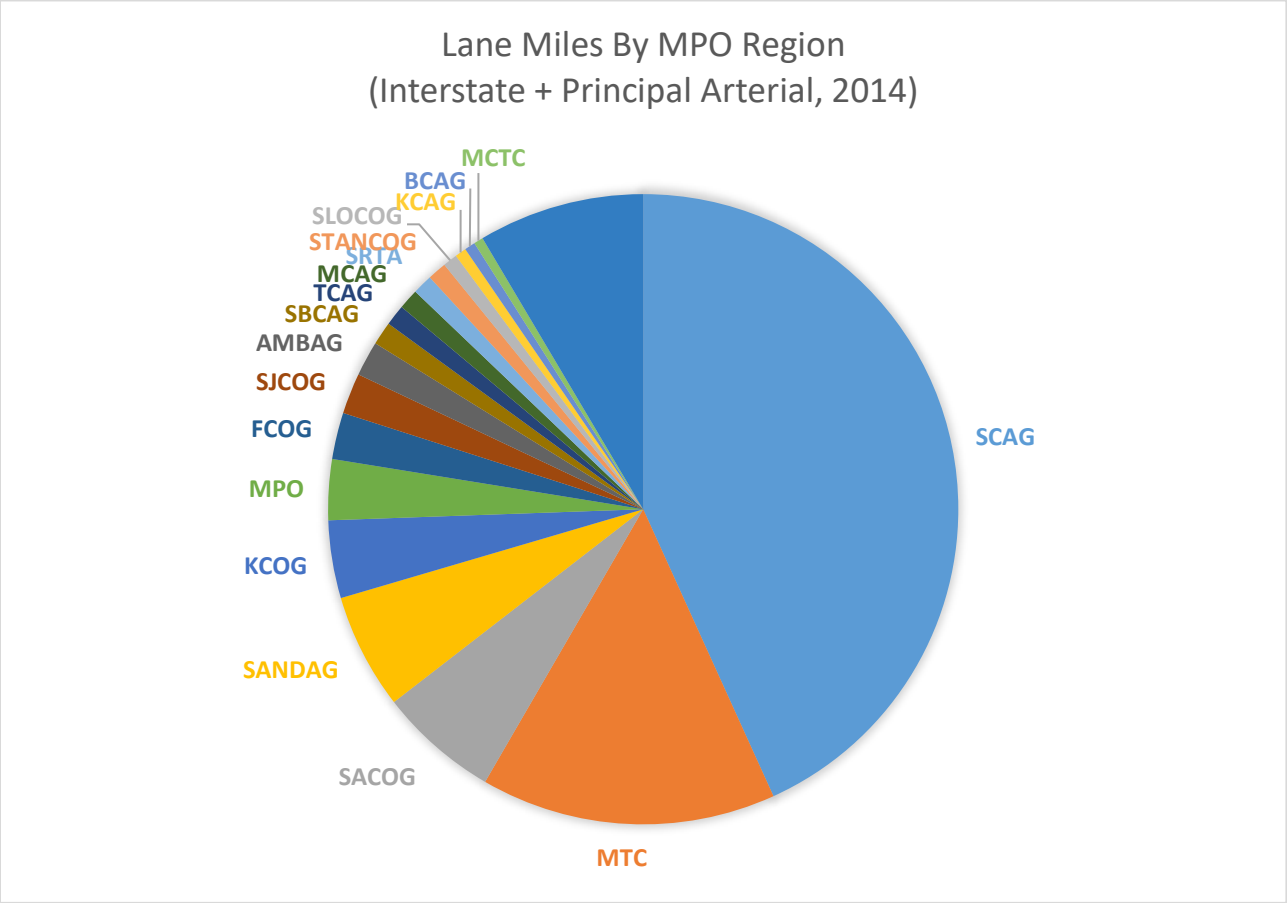
Data Source: HPMS



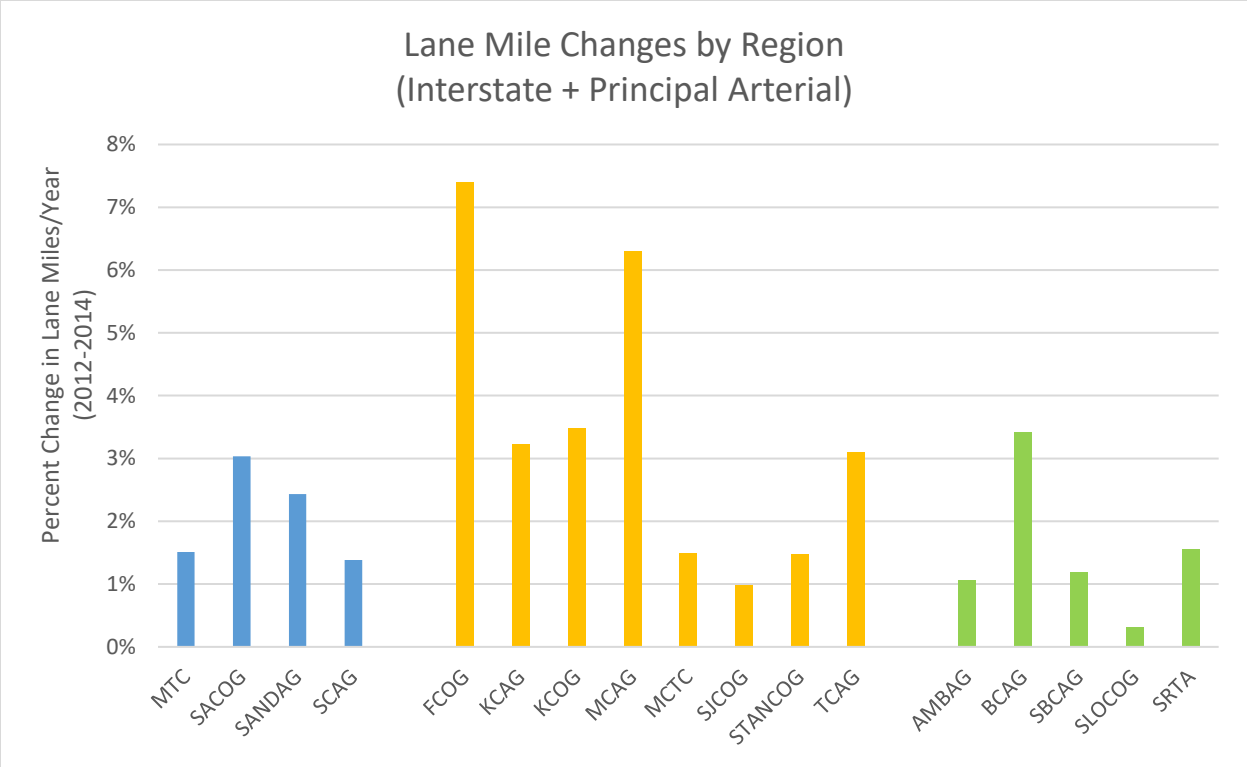
Data Source: HPMS



Data Source: HPMS



Data Source: HPMS



Data Source: HPMS

Change in Long-Term and Short-Term Spending Plans by Mode

To analyze transportation funding and spending, CARB staff requested information from MPOs and consulted published plan documents. This analysis sought to understand both long-term and short-term spending plans. CARB staff compared investment data available for (a) the most recent two long-term spending plans in Regional Transportation Plans (RTPs) in all regions, and (b) the three most recent Transportation Improvement Programs (TIPs) in the four largest MPO regions.

RTPs typically cover a period of two to three decades and must cover at least 20 years. For example, FCOG's 2018 RTP covers 25 years (2018-2042). The RTPs provide a fiscally-constrained list of transportation expenditures that can be paid for by funds that are reasonably expected to be available. These documents are updated every four years.

TIPs cover a much shorter time frame, typically four to six years. They do not need to include all transportation revenues and projects, only those that receive federal funds, require federal action, or are regionally significant. For example, this need not include all road repair projects funded by state dollars.

Method

CARB staff provided a spreadsheet to MPO staff that requested the following information:

- Background information for the two most recent RTPs and three most recent TIPs:
  - Plan year, base year, horizon year, and years covered
  - Total budget and currency (year of expenditure or constant dollars)
- Spending by mode for the RTPs: total, and for the most recent, also by time period and by funding source (local/regional, state, federal)
- Spending by mode for the TIPs, and other spending that would occur during the most recent TIP time period that was not included in the TIP

Fourteen of 18 MPOs provided information responding to the transportation funding and spending information request. CARB staff reviewed the information for internal consistency (e.g., that totals matched stated plan totals) and requested further clarification from MPOs where information was unclear.

The only datasets that were complete enough to be used were total spending by mode for current and previous RTPs, and in the four largest regions, current and previous spending in the TIPs. When data was available, CARB also provided a chart distinguishing between capital and maintenance for both roadways and transit. Where information was not provided, CARB staff consulted printed RTPs.

Results

Altogether, the analysis found that over $1.1 trillion (in escalated Year of Expenditure dollars) will be spent during the life of California's adopted Regional Transportation Plans/Sustainable Communities Strategies across all 18 regions. The RTPs are an important tool for understanding what transportation expenditures are planned over the next two to three decades.

The analysis found that in the four largest regions, significant funding shifts did not occur between the previous and current RTP, nor in the most recent three TIPs, with some important exceptions as explained in the main report, such as an increase in active transportation spending. In smaller regions, some shifts were observed, as the charts below indicate.

Discussion

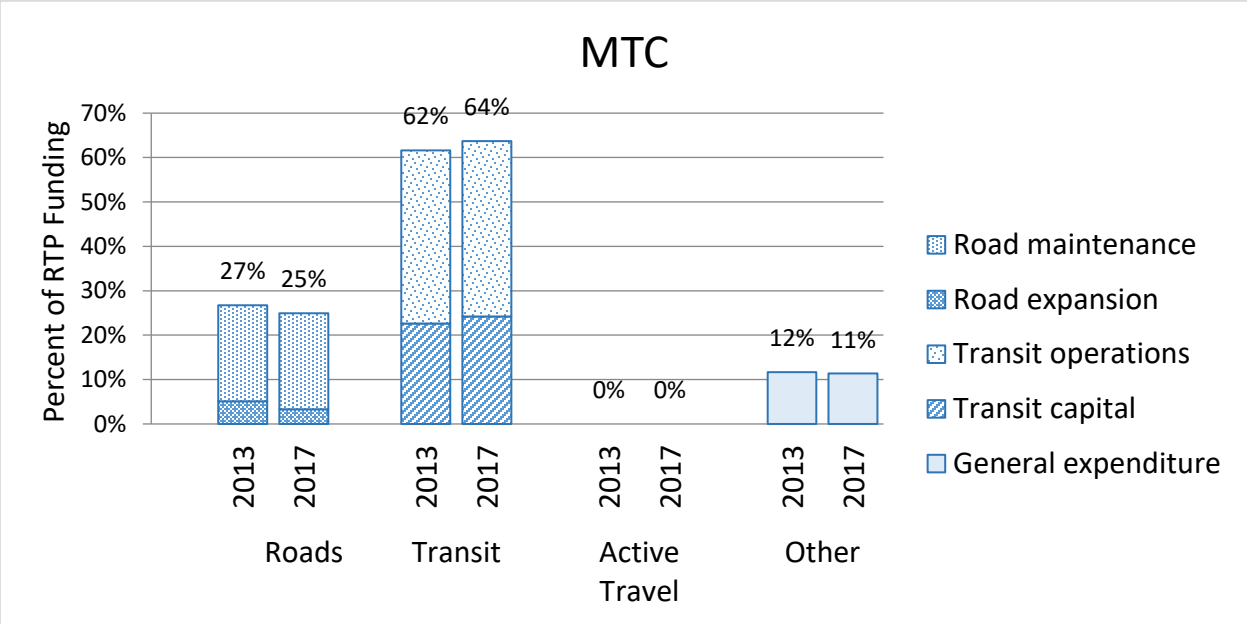
This summary of spending information is intended to start, not end, the conversation about how transportation dollars are being spent. The charts should be a jumping-off point for further investigation. Some considerations to keep in mind in reviewing this information include:

- MPOs have discretionary authority over a portion of funds in RTPs and TIPs, and that portion differs significantly by region. Local governments, County Transportation Commissions, and transit agencies are examples of other authorities with decision-making authority over funds in RTPs and TIPs. Local transportation authorities manage funds from self-help transportation sales tax measures, which often identify specific transportation projects as part of the package put to voters. These summaries therefore represent the collective decisions of local, sub-regional, and regional agencies, both past and present.
- Many transportation funding sources specify how money can be used, making it difficult for transportation agencies to shift funding from one mode or purpose to another. Some can be very specific; for instance, the Federal Transit Administration provides funding specifically to enhance public transportation mobility for seniors and individuals with disabilities under 49 U.S.C. 5310. Another example that came up several times during this research is that under Article 19 of the California Constitution, funds collected from motor vehicle taxes may not be used for public transit maintenance and operation costs. Restrictions such as these limit the flexibility of funding. They also mean that if a significant source of funding is gained or lost, that may shift what spending is planned without any change in regional priorities.
- Regions categorize spending differently from one another, so great caution should be used in comparing between regions. For instance, many road projects include improvements to bicycle and pedestrian infrastructure. Furthermore, buses and bicycles use roadways, so they may benefit from road maintenance or

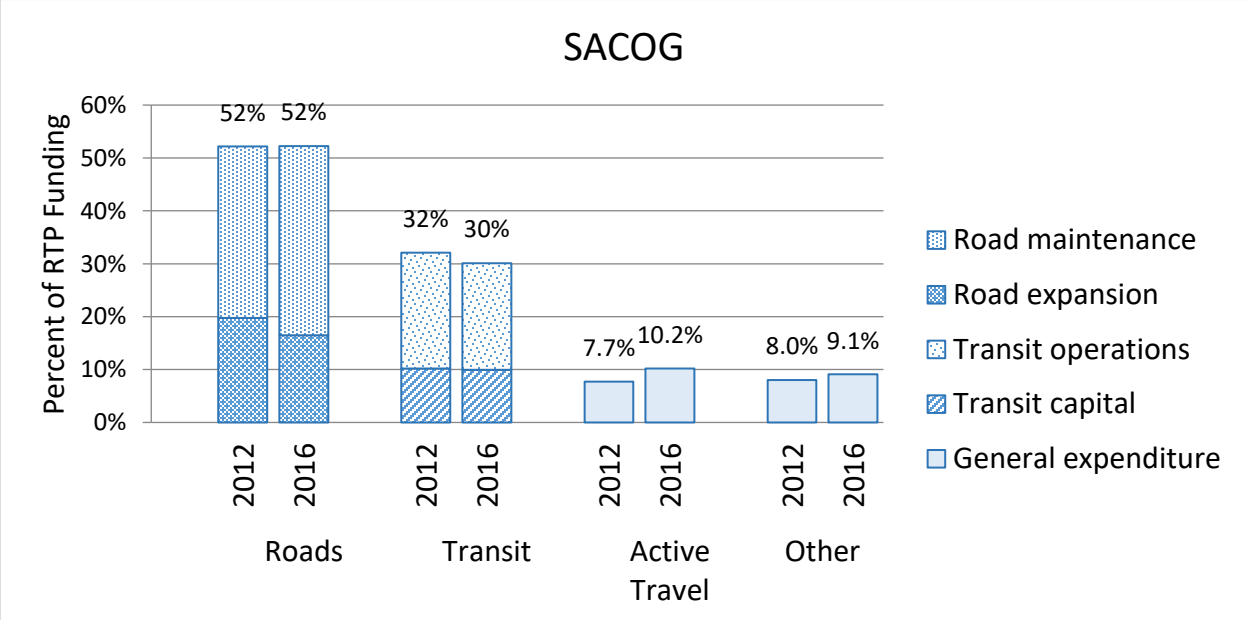
high-occupancy vehicle lanes. Additionally, many of the expenditures included in the different modal categories are for maintenance/operations/rehab purposes. Some regions have methods for differentiating these portions of a project, but often they are included within one category of road investments. Similarly, regions differentiate between transit capital and maintenance/operations in different ways. For instance, MTC includes operations costs for new transit lines within their capital investment category, which could make their transit capital category appear larger than a region that included operations for new lines in the transit maintenance/operations category. In addition, some regions have combined passenger- and freight-rail projects under a single "rail" category, which would fall under "other," while many have included passenger-rail projects in the public transit category.

- A single project can sometimes significantly skew the percentages, particularly in smaller regions. For instance, if one RTP included High Speed Rail and the previous one did not, that might appear to be a large increase in transit funding between the plans even though the remainder of the plan was largely unchanged.
- Because transportation projects can take a decade to be built, a single project will appear in multiple TIPs, which reduces the change possible from one TIP to the next. This would not explain a lack of change in RTPs, as those include two to three decades of spending, including many projects whose construction has not yet begun.
- Forecasting transportation revenues and expenditures several decades into the future requires making many assumptions. Revenue sources may shift as policies change. Capital projects and the spending to support them may reflect detailed long-term plans but in some cases are based upon the cost estimates to build out shorter-range plans, then extrapolated. As new technologies such as automated vehicles accelerate the pace of change in the transportation sector, the uncertainty around these forecasts increases.

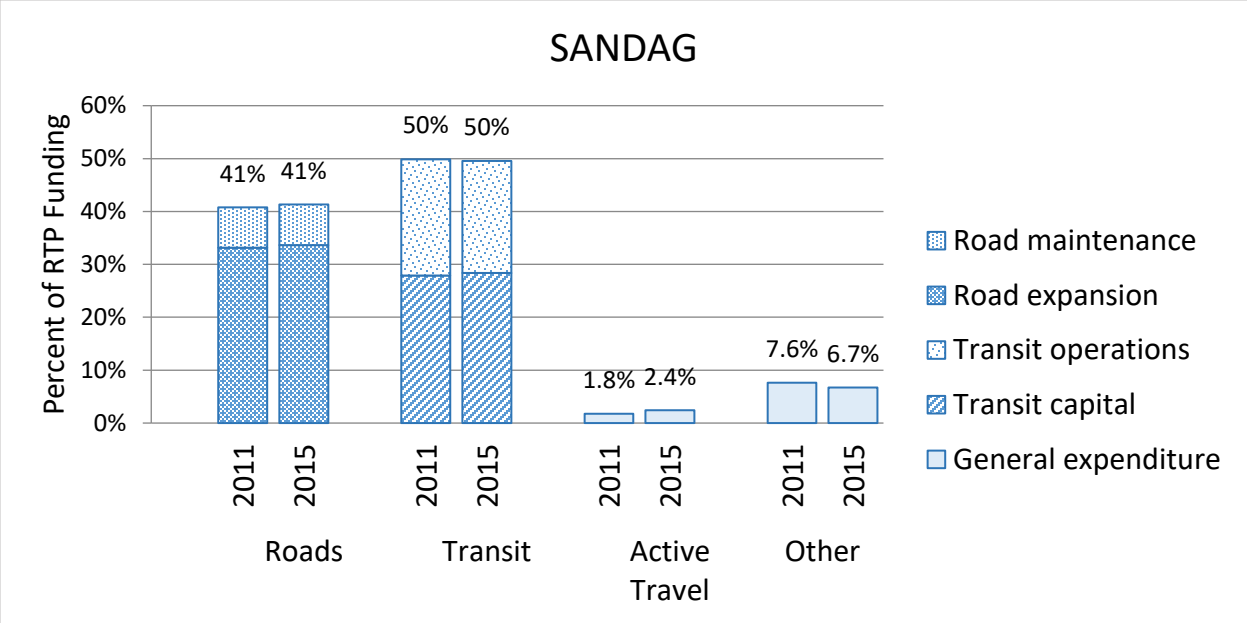
RTP Expenditures by Mode - Big 4 MPOs



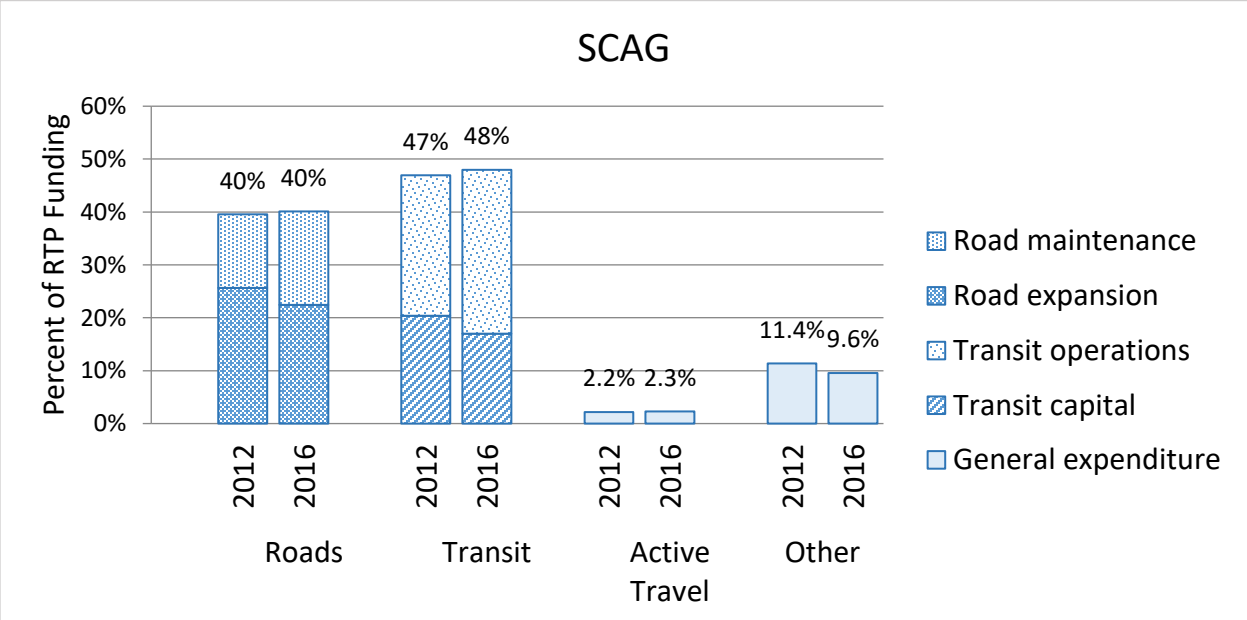
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: Active travel expenditures are included under Roads. Transit capital includes capital replacement, efficiency/modernization projects, and capital expansion/extension. Future operations costs for transit expansion projects are included within the transit capital cost for that project.



Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: Unlike other regions, for SACOG this chart reflects non-escalated dollar values instead of year of expenditure dollar values.

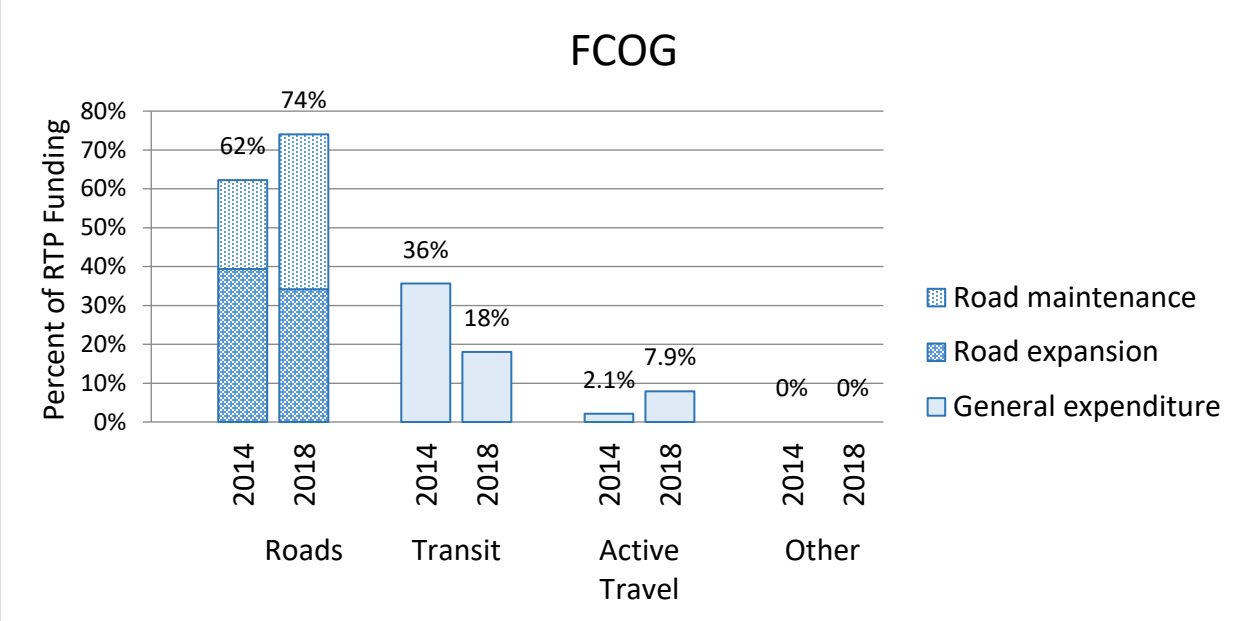


Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: For local roads, expansion and maintenance were provided as a single combined figure, and were included here in "road expansion." Transit Operations includes Transit Operators' Capital Improvement Programs and capital investments for maintaining a state of good repair. Transit Capital projects include capacity-increasing transit projects and goods movement projects. Rail, included here in Other, includes San Ysidro Freight Yard. Grade separations are included in Transit Operations, General Purpose Highway, and Other Road Capacity Expansion.

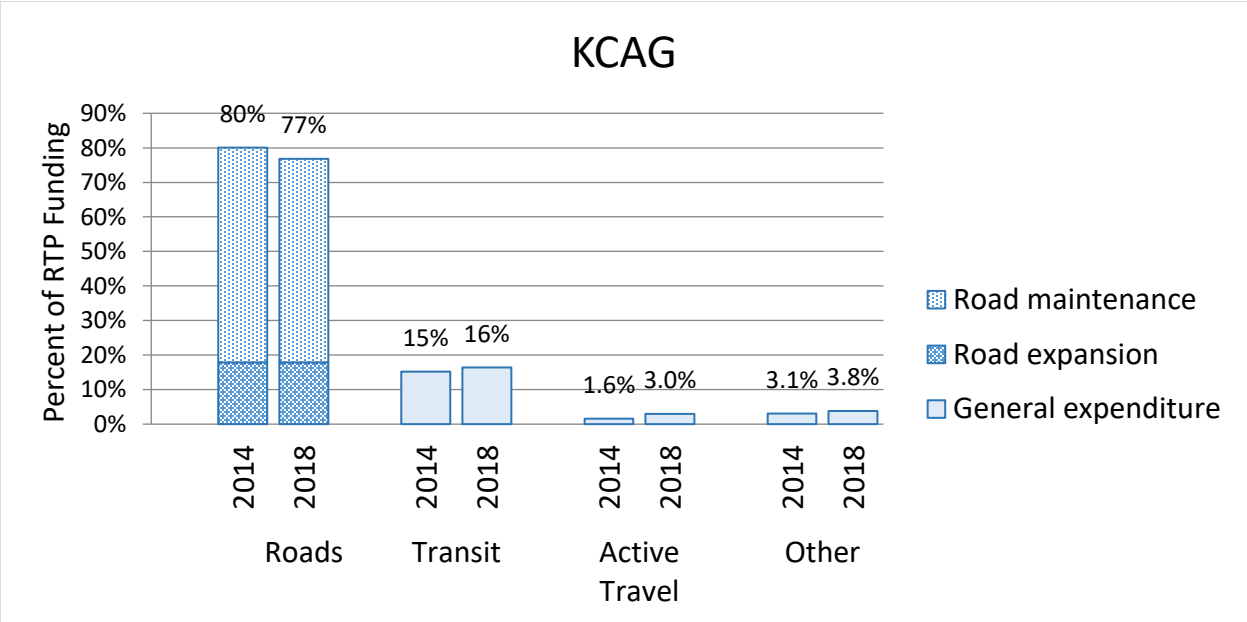


Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: $4.8 billion for active transportation investments were shifted from "Regionally Significant Local Streets and Roads maintenance" to "Active Travel" per footnote from SCAG explaining that the funds were used for maintaining active transportation investments.

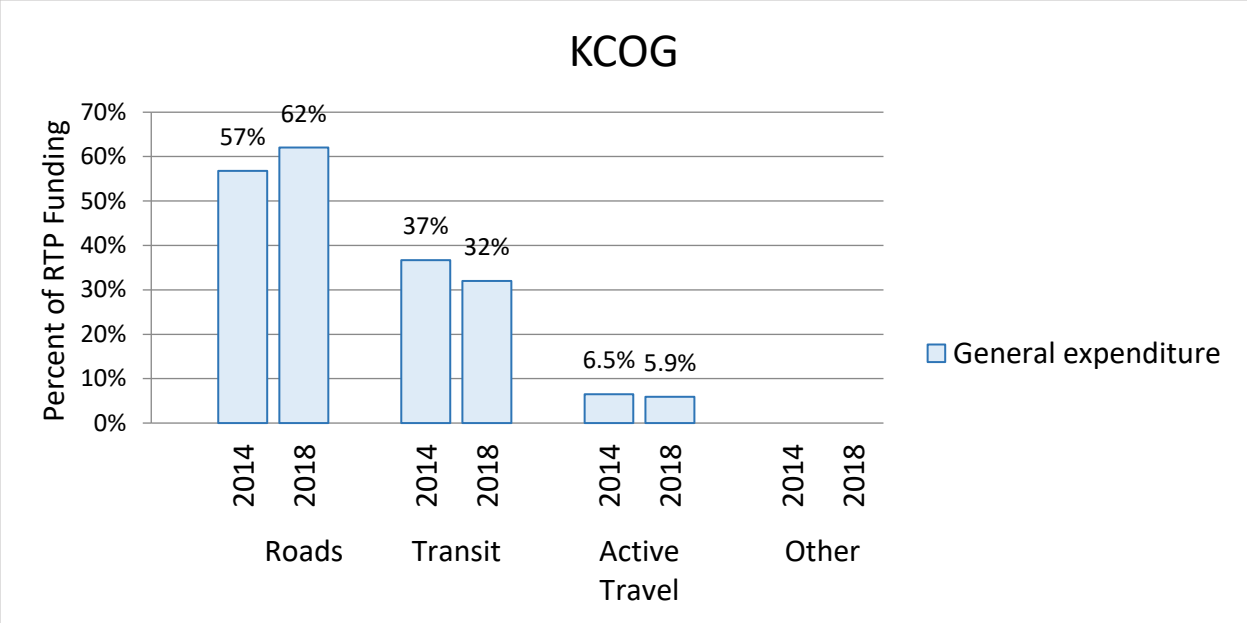
RTP Expenditures by Mode - SJV MPOs



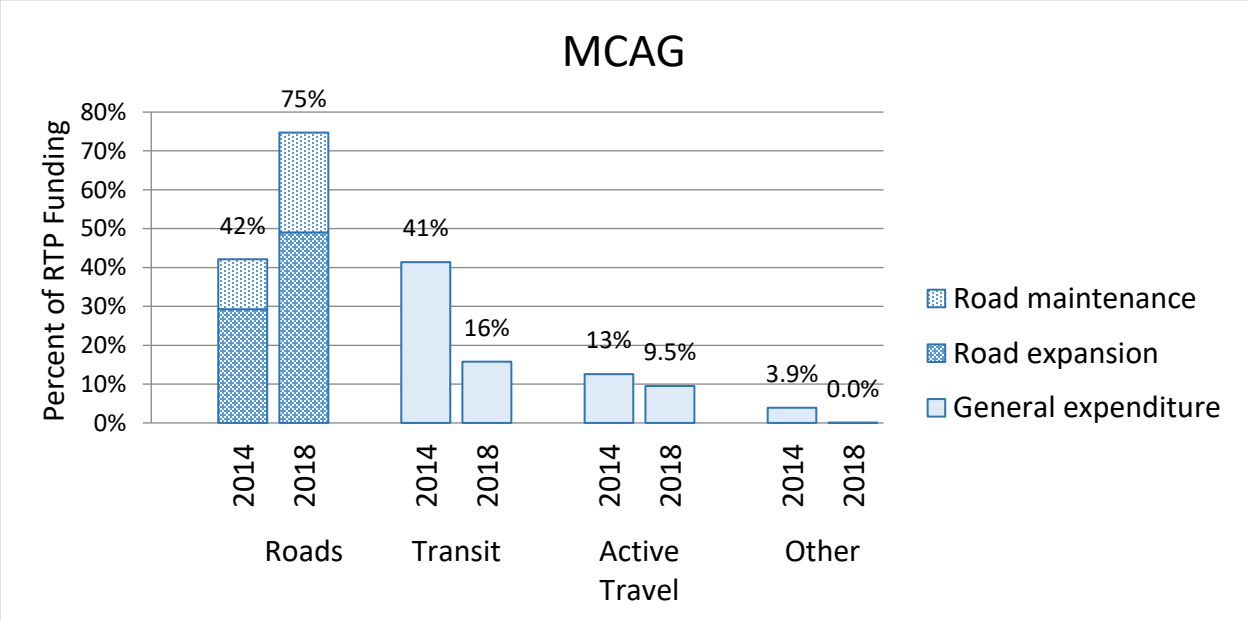
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: Neither the 2014 RTP nor the 2018 RTP included any funding for the CA high-speed rail projects. The 2018 RTP included an improved methodology for estimating the cost of transit projects. In the four-year period between the two plans, the Fresno bus rapid transit (BRT) project was completed, which represented a significant share of the transit funding reported in the 2014 plan.



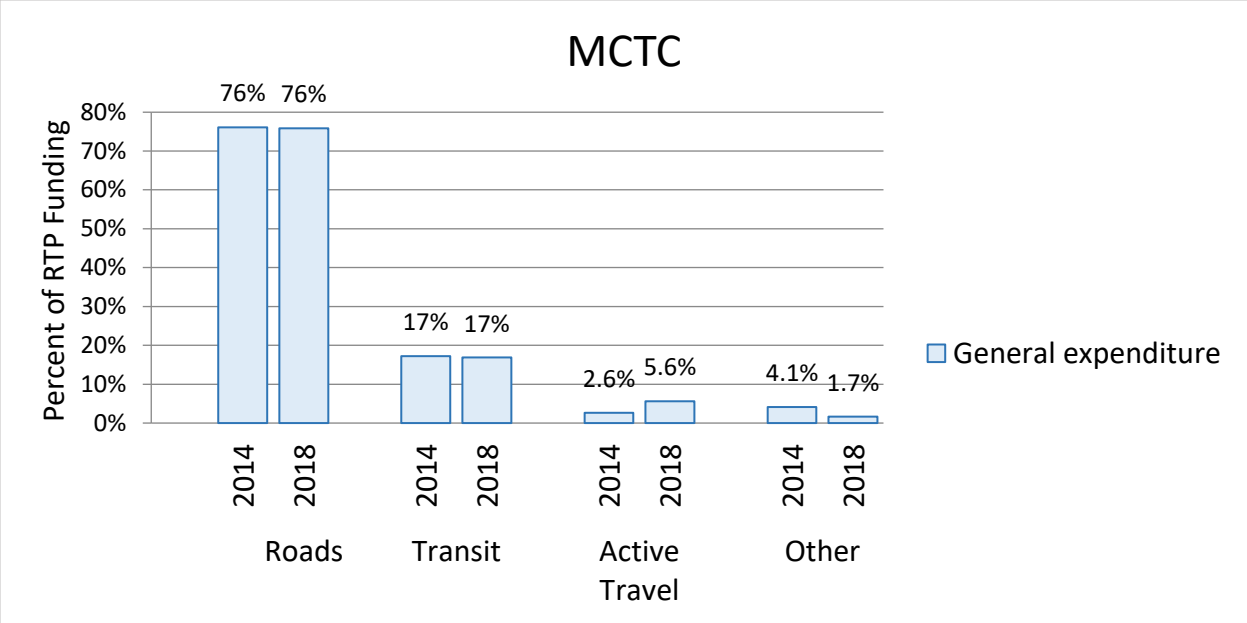
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: "Safety" spending was included under "Road and Highway Maintenance."



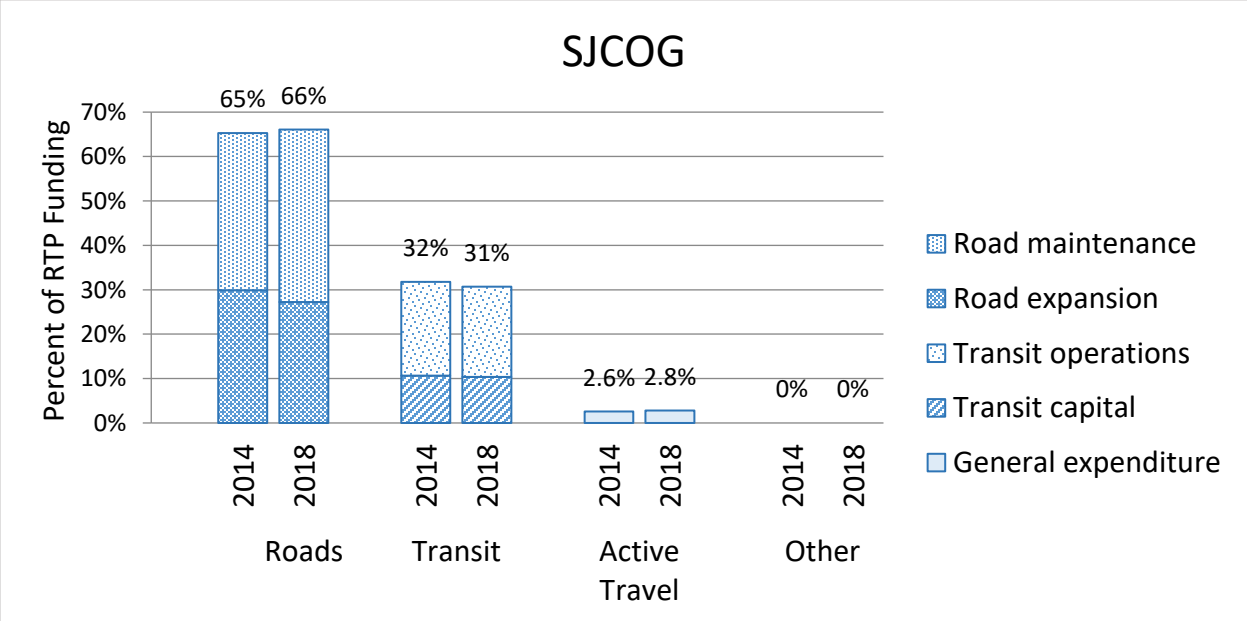
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: KCOG's active transportation investments in its 2010 SCS were 0.5 percent of its budget.



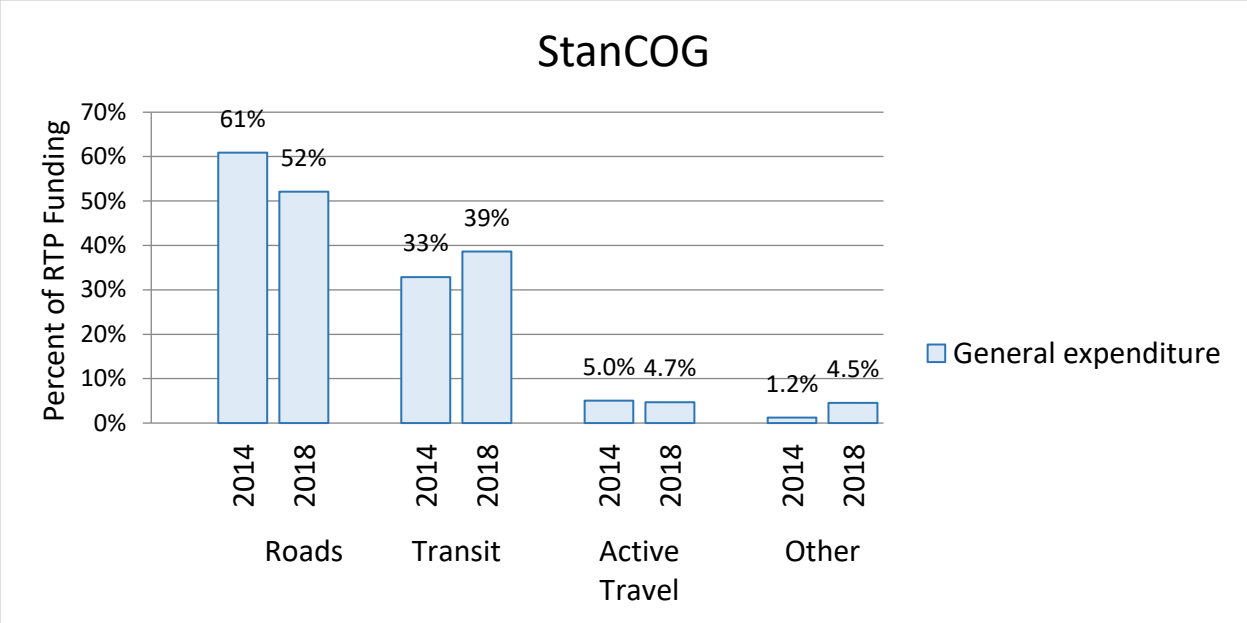
Data Source: CARB SB 150 MPO data request and consulted printed plans.



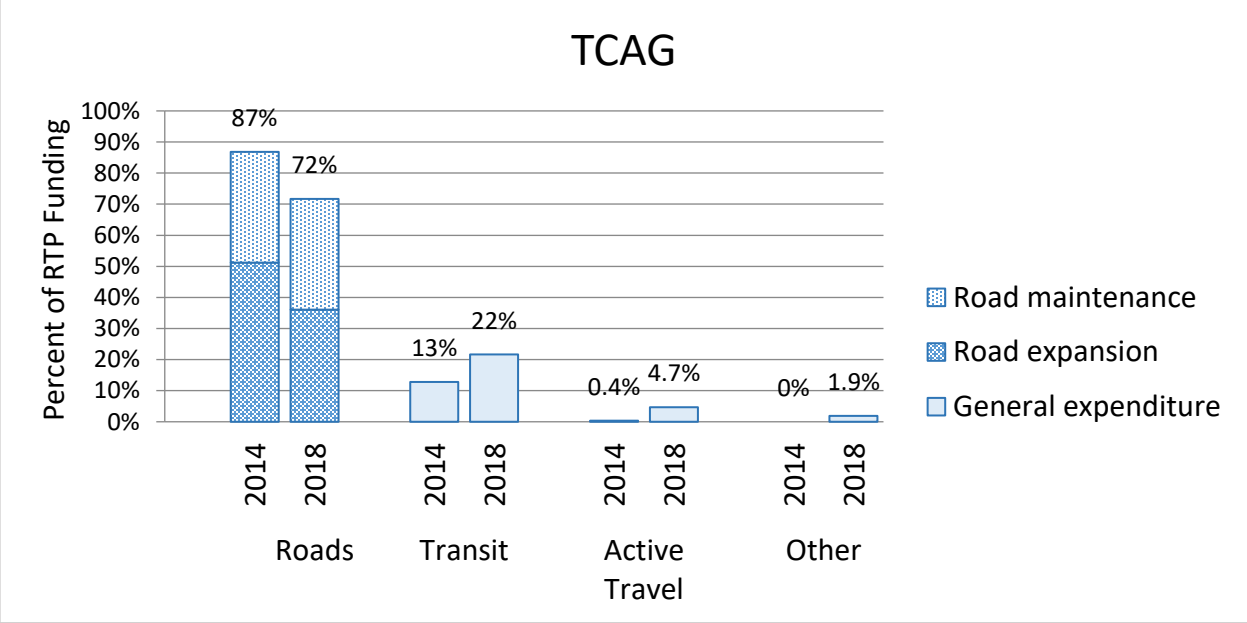
Data Source: CARB SB 150 MPO data request and consulted printed plans.



Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: "Safety" improvements were included with "roadway maintenance." Other "community enhancements" were included with "active transportation." Spending data excludes aviation projects totaling $120 million in RTP/SCS investments.

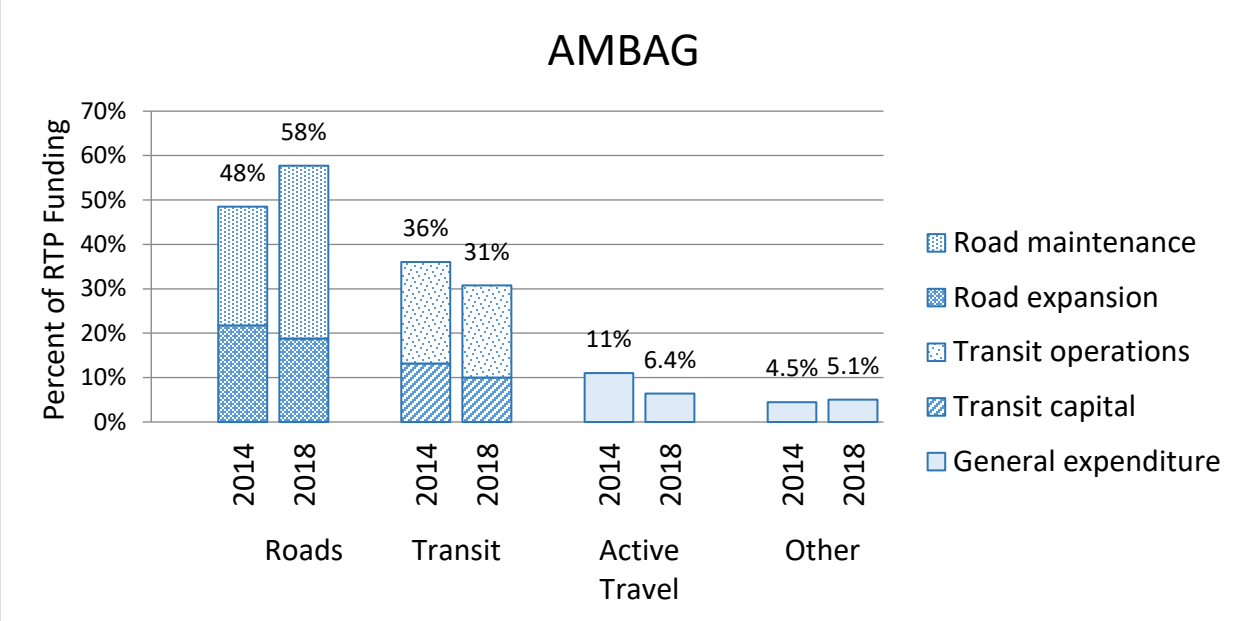


Data Source: CARB SB 150 MPO data request and consulted printed plans.

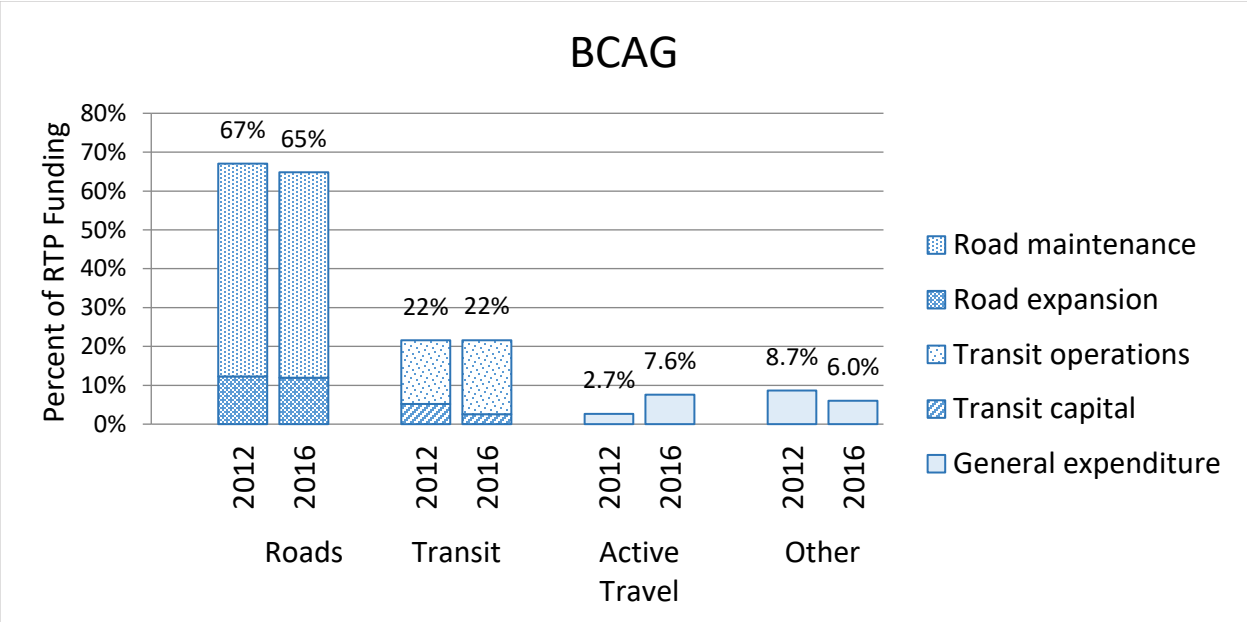


Data Source: CARB SB 150 MPO data request and consulted printed plans.

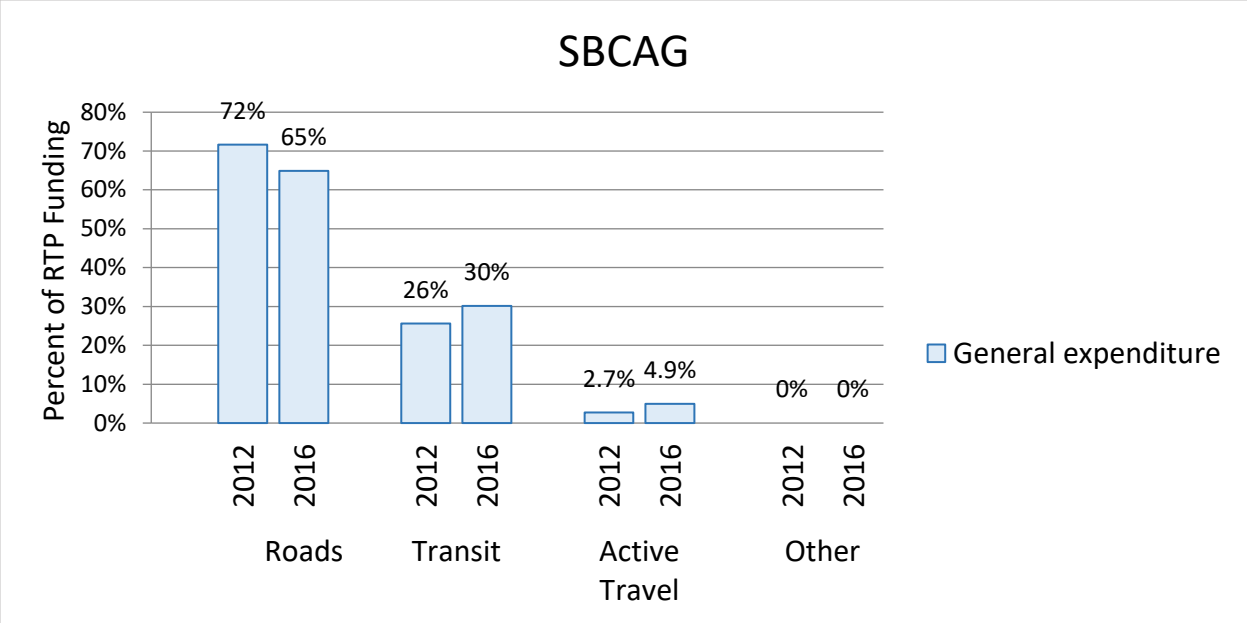
RTP Expenditures by Mode - Remaining MPOs



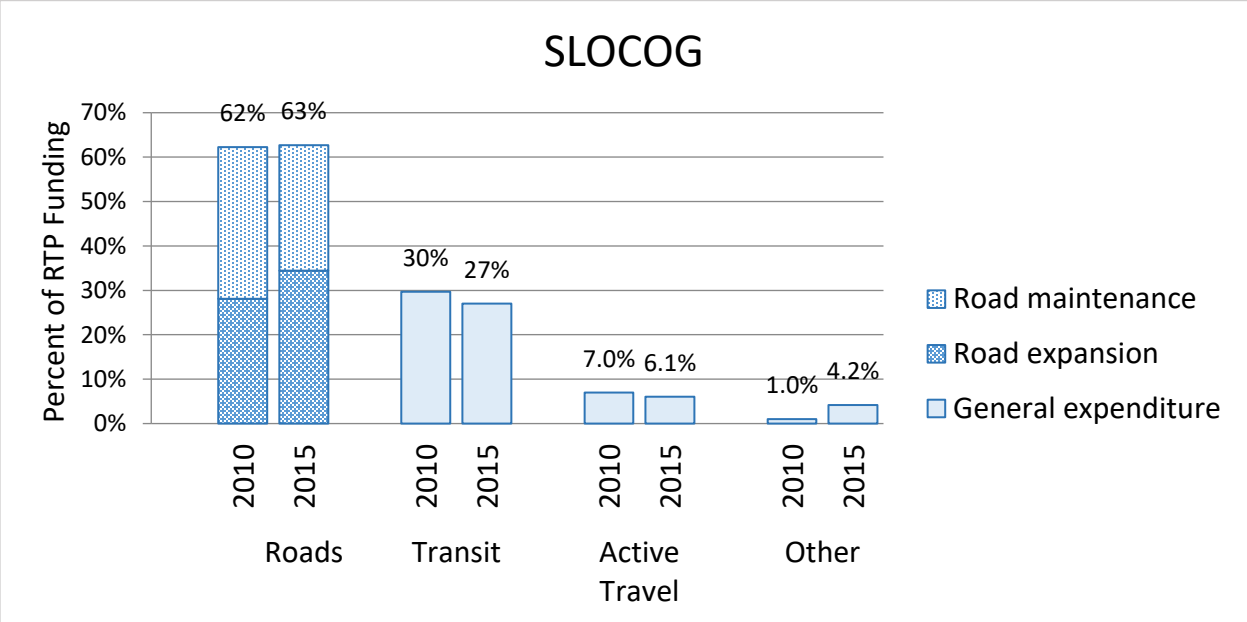
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: Transit Capital includes "Transit - New Capacity" and "Transit - Fleet Rehab & Capital." Transit Operations also includes "Paratransit Operations & Capital." Other includes "airports, planning, and other."



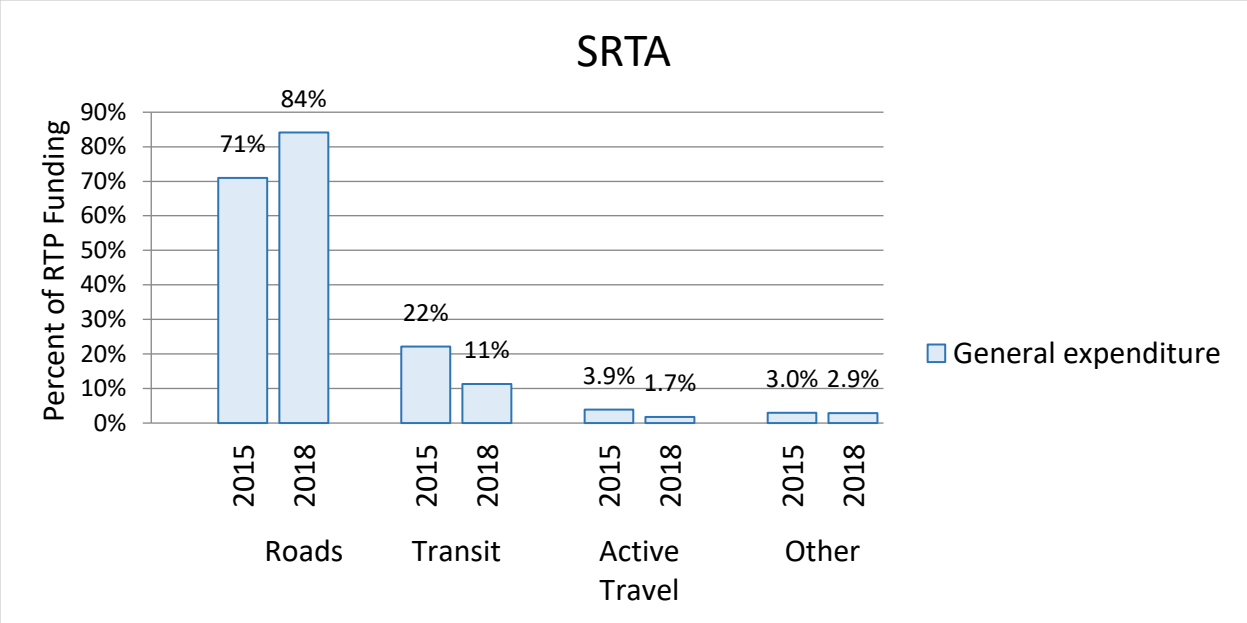
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: "Other" spending is for "Planning."



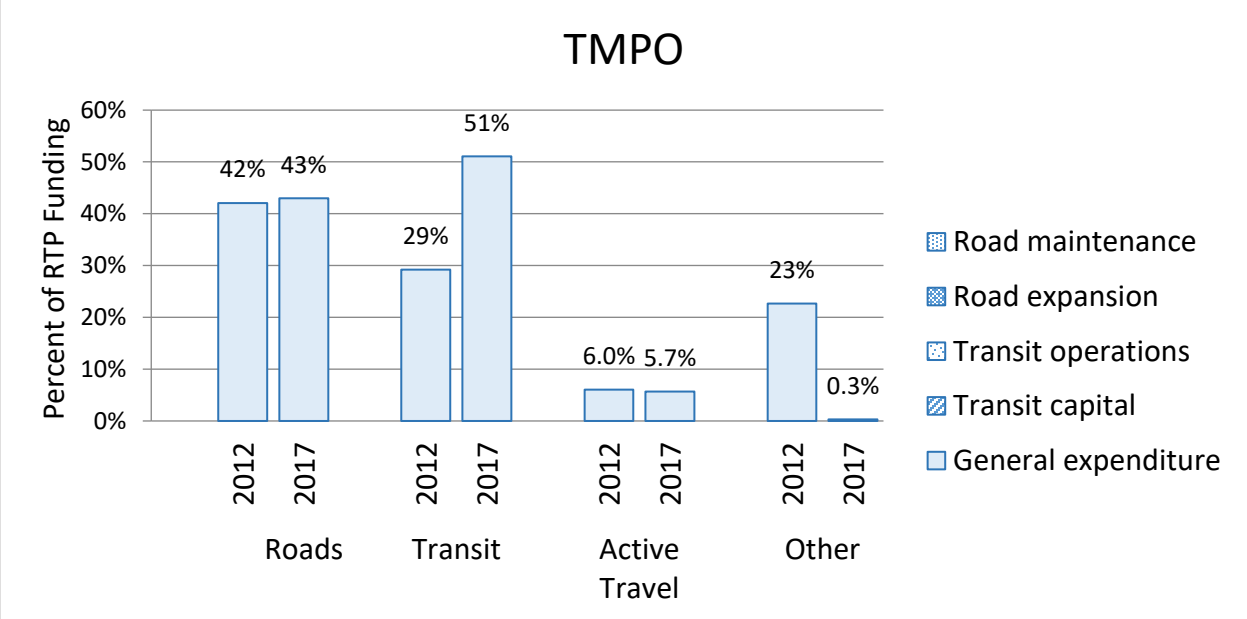
Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: Dollar figures for "Other" were moved to "Road & Highway Maintenance" per a footnote describing them as "primarily roadway maintenance and intersection improvements."



Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: For 2015, "other" includes TDM, TSM, and ITS projects that are a mix of roadway and transit improvements, and for 2010, "other" includes TDM / Rideshare.

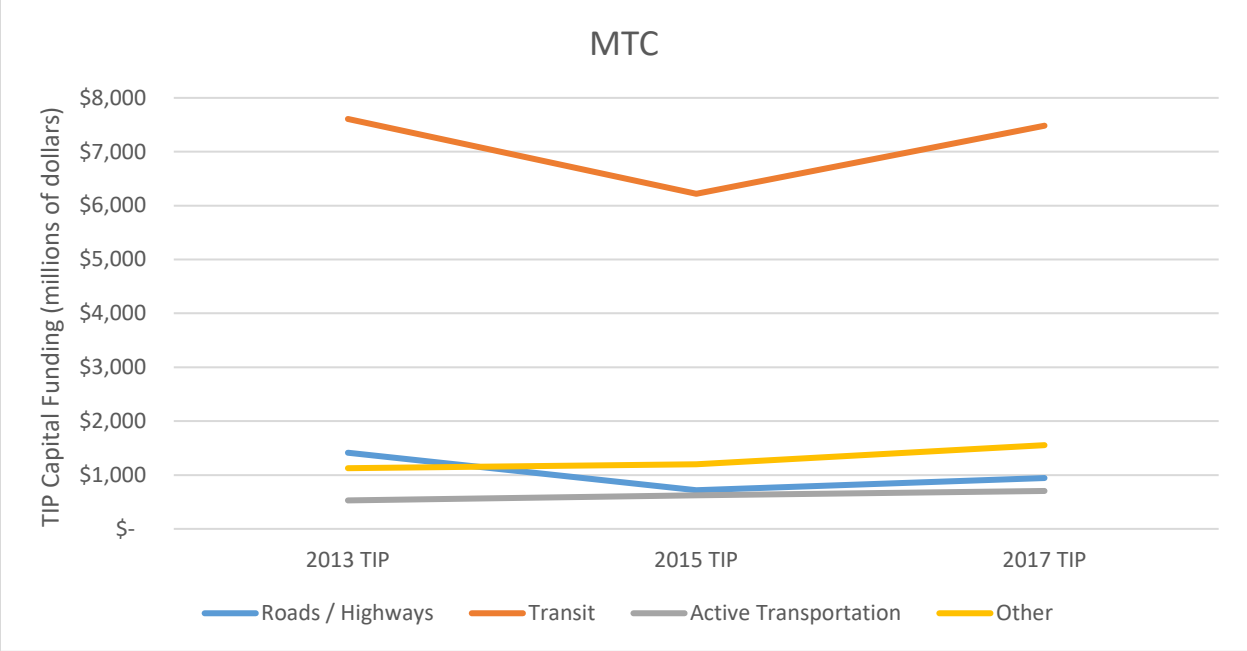


Data Source: CARB SB 150 MPO data request and consulted printed plans.

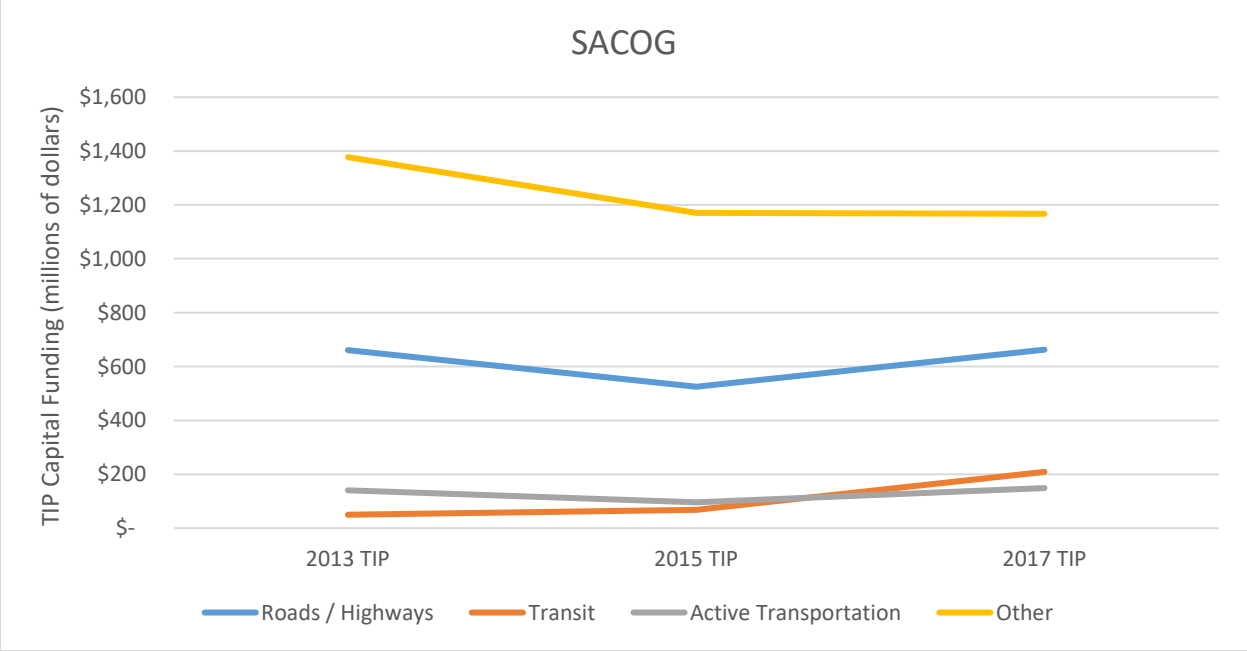


Data Source: CARB SB 150 MPO data request and consulted printed plans.
Note: Some of the apparent difference between 2012 and 2017 expenditures may result from projects being categorized between "Roads" and "Other" differently. For 2012, "Roads" includes "Corridor Revitalization Projects," "Local Roadway TMDL Strategies," "Streets and Roads O&M," "Safety & Rehabilitation Projects," "Minor SHOPP Projects," and "Emergency Roadway Repair Projects." "Other" includes "Stormwater Strategies," "Stormwater Treatment Facilities O&M," and "Transportation System Management and ITS Strategies." For 2017, CARB used a categorization provided by TMPO.

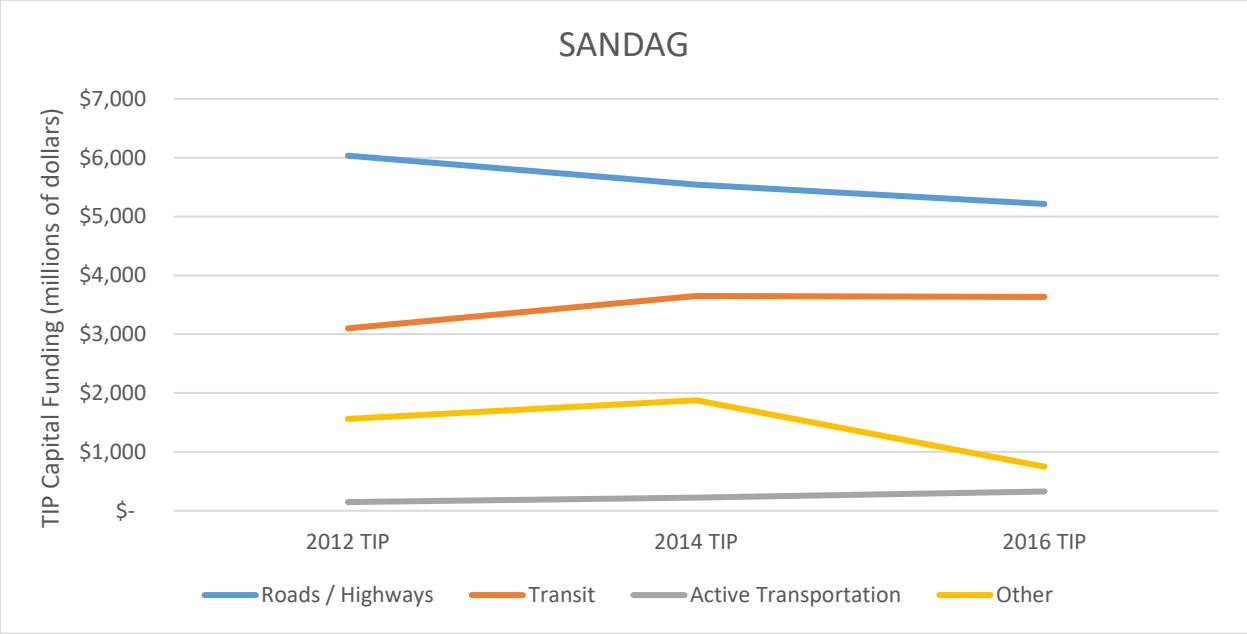
TIP Expenditures by Mode (Capital Only) – Big 4 MPOs



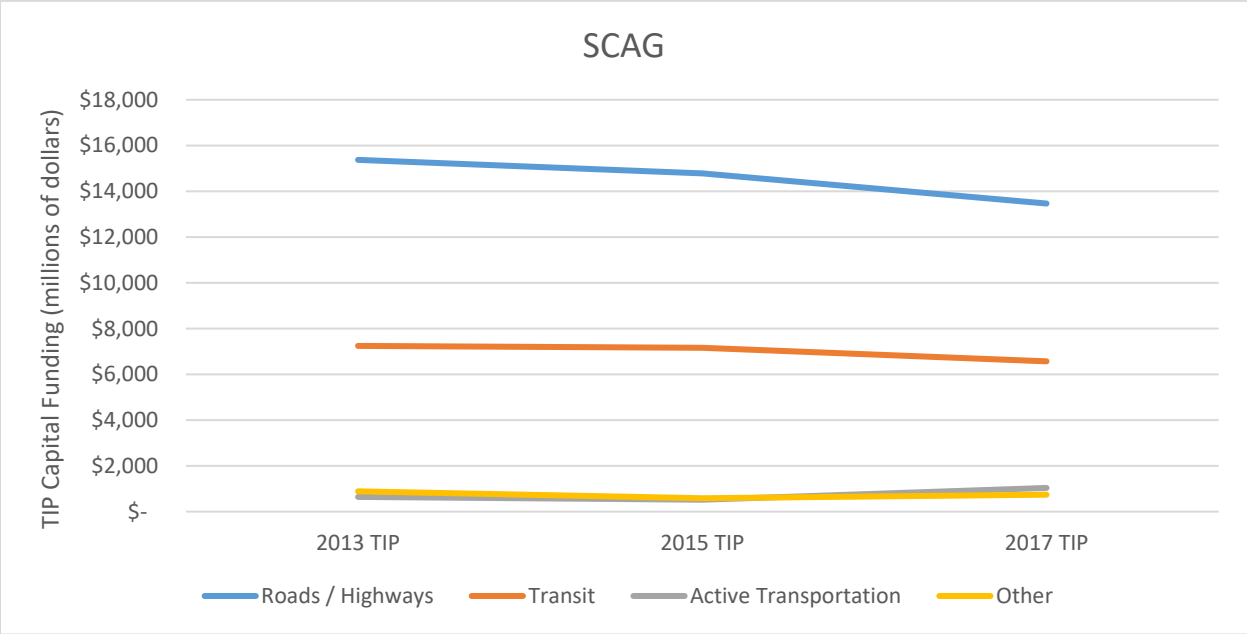
Note: Other in this chart includes: Transportation Systems Management / Intelligent Transportation Systems, Rail, Transportation Demand Management, Debt Service, Grants to Support Focused Growth, Electric Vehicle Infrastructure, and Other.



Note: Other in this chart includes: Project Analysis and Development, Community Design Program, Air Quality Programs, Transportation Demand Management & Traveler Information, Landscaping & Transportation Enhancements, Rail, Transportation Systems Management/Intelligent Transportation Systems, and Electric Vehicle Infrastructure.



Note: Other in this chart includes: Debt Service, Transportation Systems Management / Intelligent Transportation Systems, Rail, Transportation Demand Management, Grants to Support Focused Growth, the Environmental Mitigation Program (which is included in Highway Capital projects in the RTP chart), and Other. Grade separations are not included in Rail for TIP columns as they are included in a variety of other categories. Transit Capital projects include capacity-increasing transit projects and goods movement projects. Rail, included here in Other, includes San Ysidro Freight Yard. Grade separations are included in Transit Operations, General Purpose Highway, and Other Road Capacity Expansion.



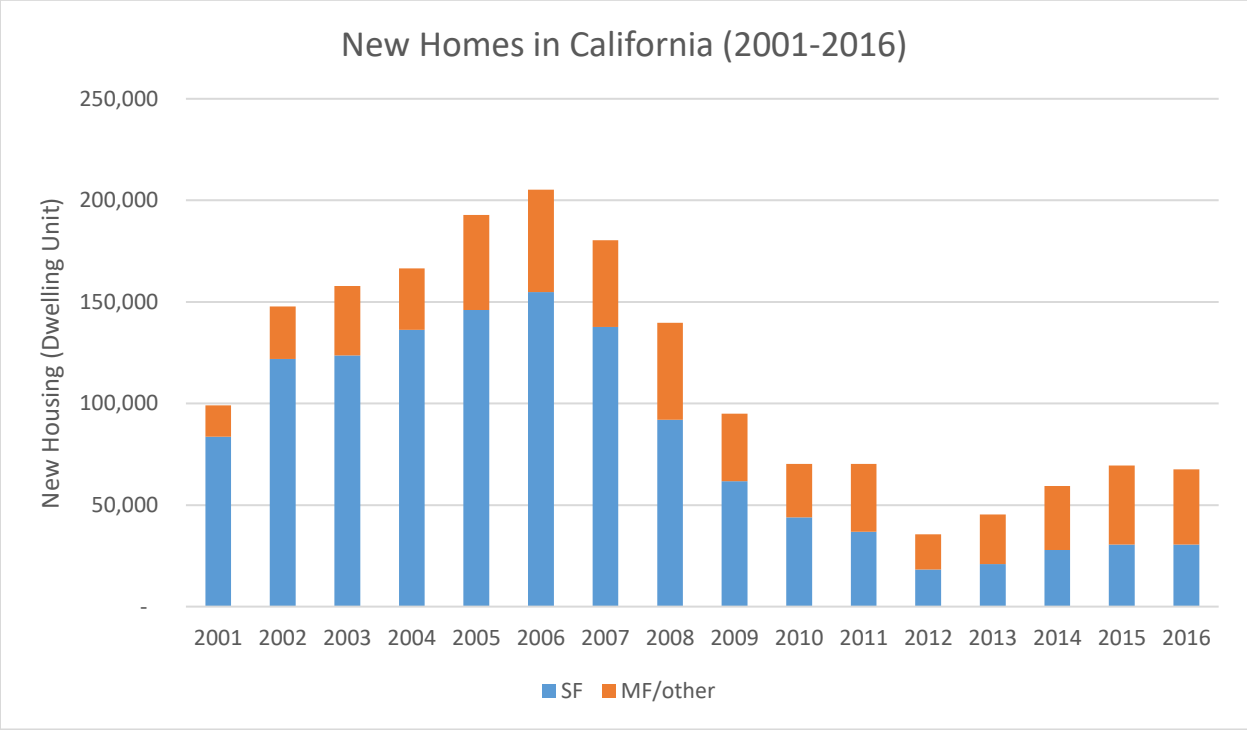
Note: Other in this chart includes: Rideshare, Transportation Demand Management (Park and Ride, Ridematching), Intelligent Transportation Systems, Administration, Ferry Service, Landscaping, Planning, Transportation Enhancement Activities, Study, and Various Agencies Lump Sum Amounts.

Housing

New Homes Built by Type

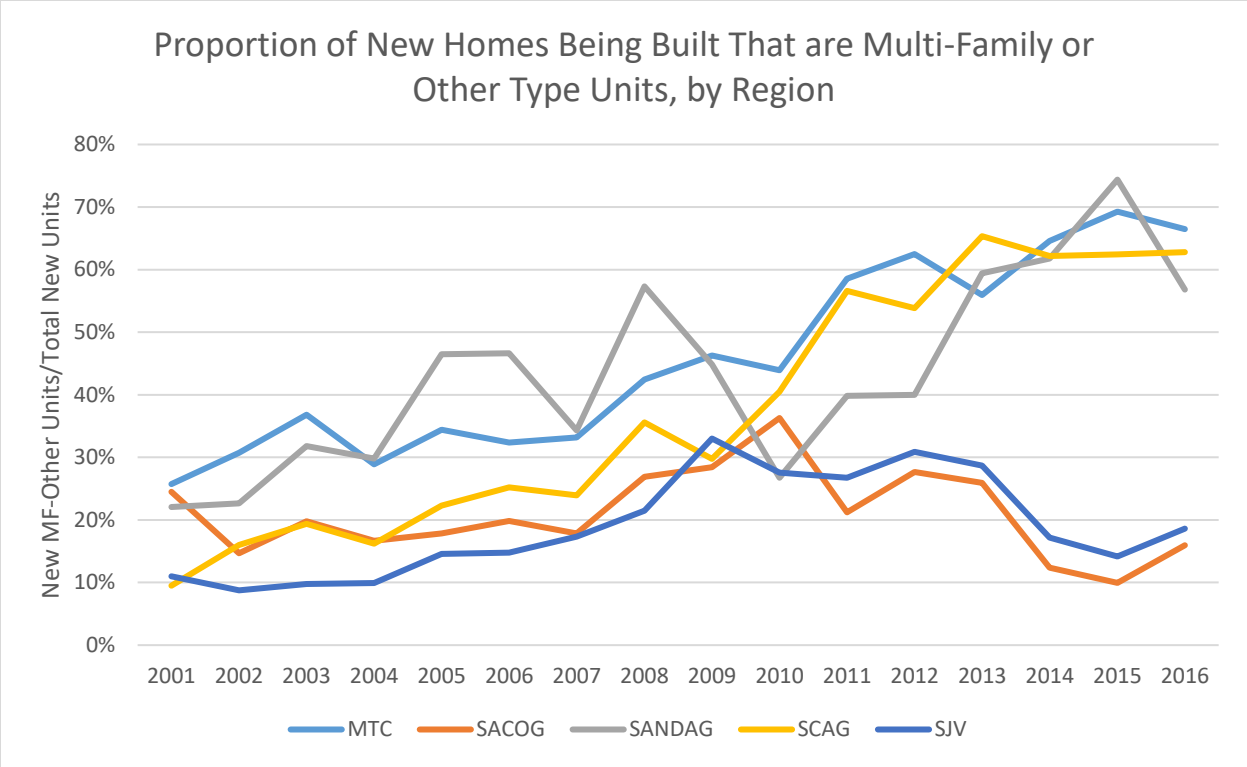
CARB staff analyzed the rate of new homes being built by type in California at both the statewide and regional levels from 2005 to 2016 using the California DOF datasets including E-5 (for years 2011 to 2016) and E-8 (for years 2005 to 2010): (http://www.dof.ca.gov/Forecasting/Demographics/Estimates/).

The statewide trend shows that the new homes in California increased quickly in the first decade of the century and started to slow down beginning in 2008, with the share of single-family house starts quickly decreasing. Starting from 2013, the share of new single-family housing units goes below 50 percent of total homes being built.

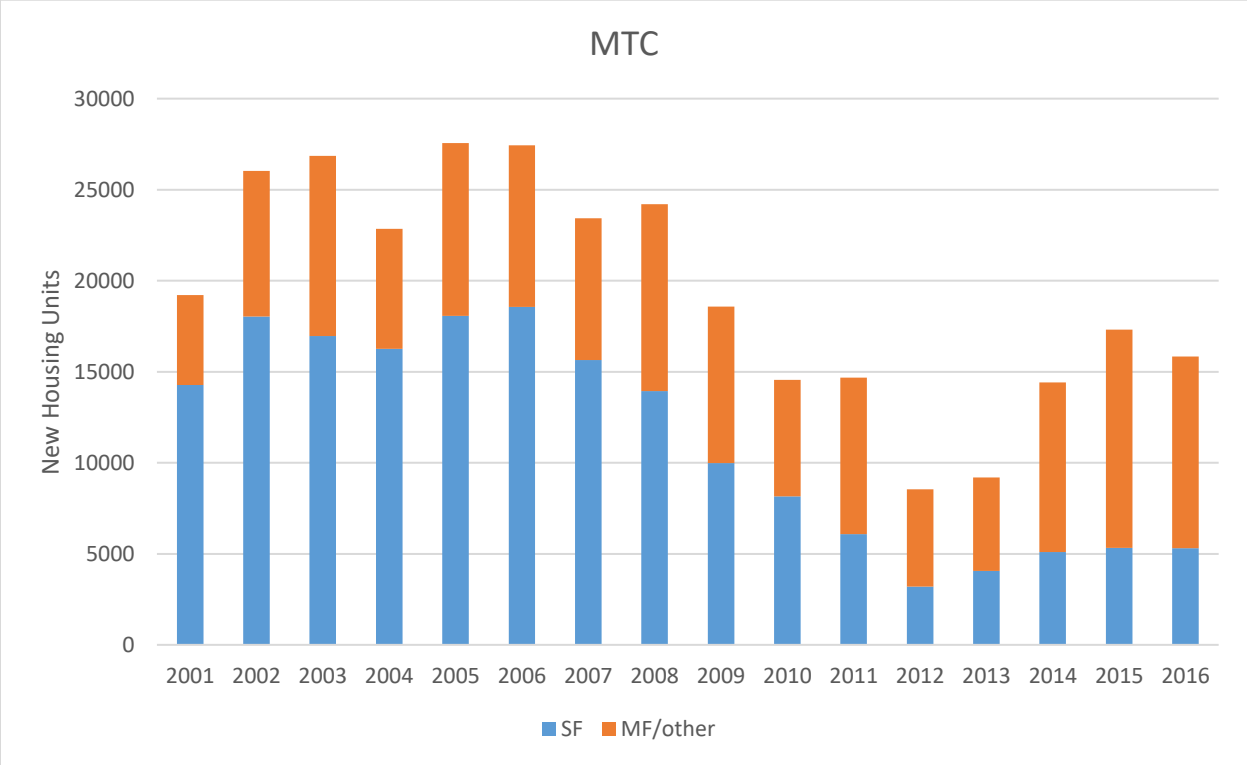


Data Source: DOF

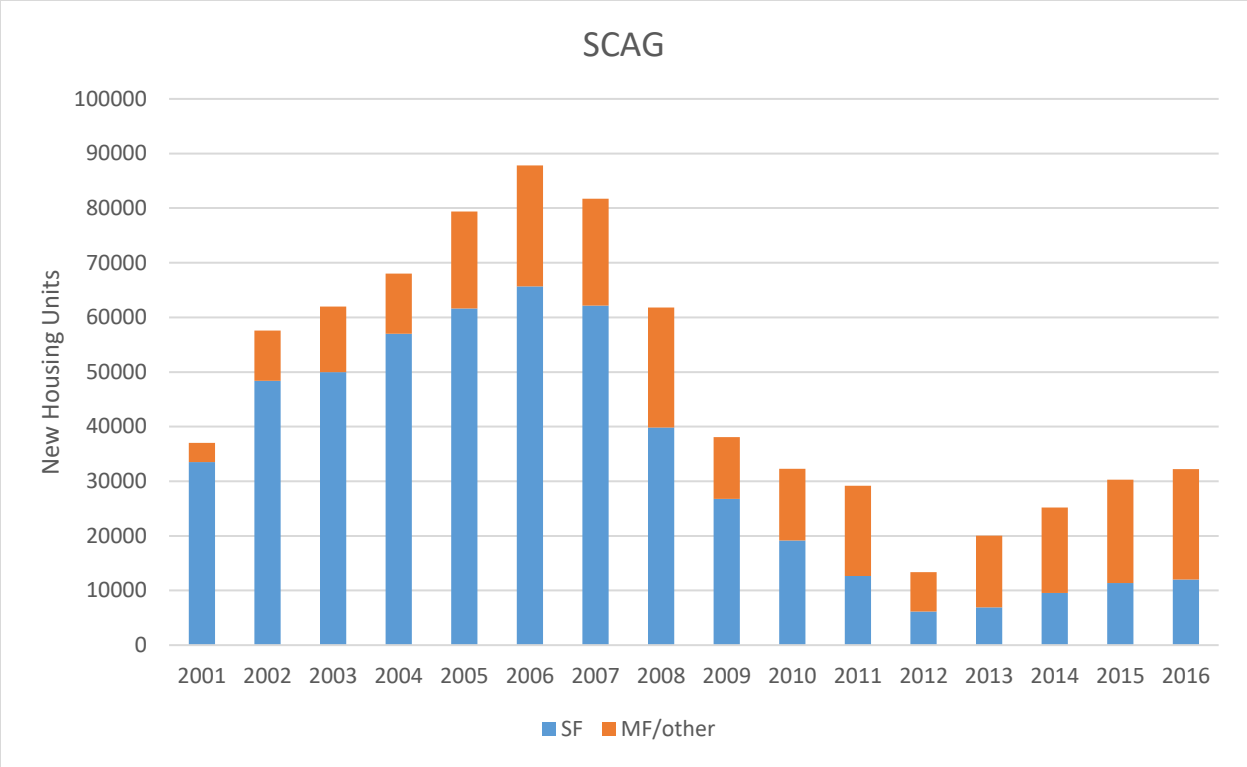
Additional investigation at the regional level shows that there is variation in new housing unit types being built across different regions in California. As shown in the following figure, as multi-family housing units starts to dominate the new home market in SCAG, MTC and SANDAG regions, the new home market in SACOG and SJV MPO regions are still dominated by single-family housing units (i.e., over 80 percent). The single-family and multi-family new housing unit distribution of individual MPOs are also provided here.



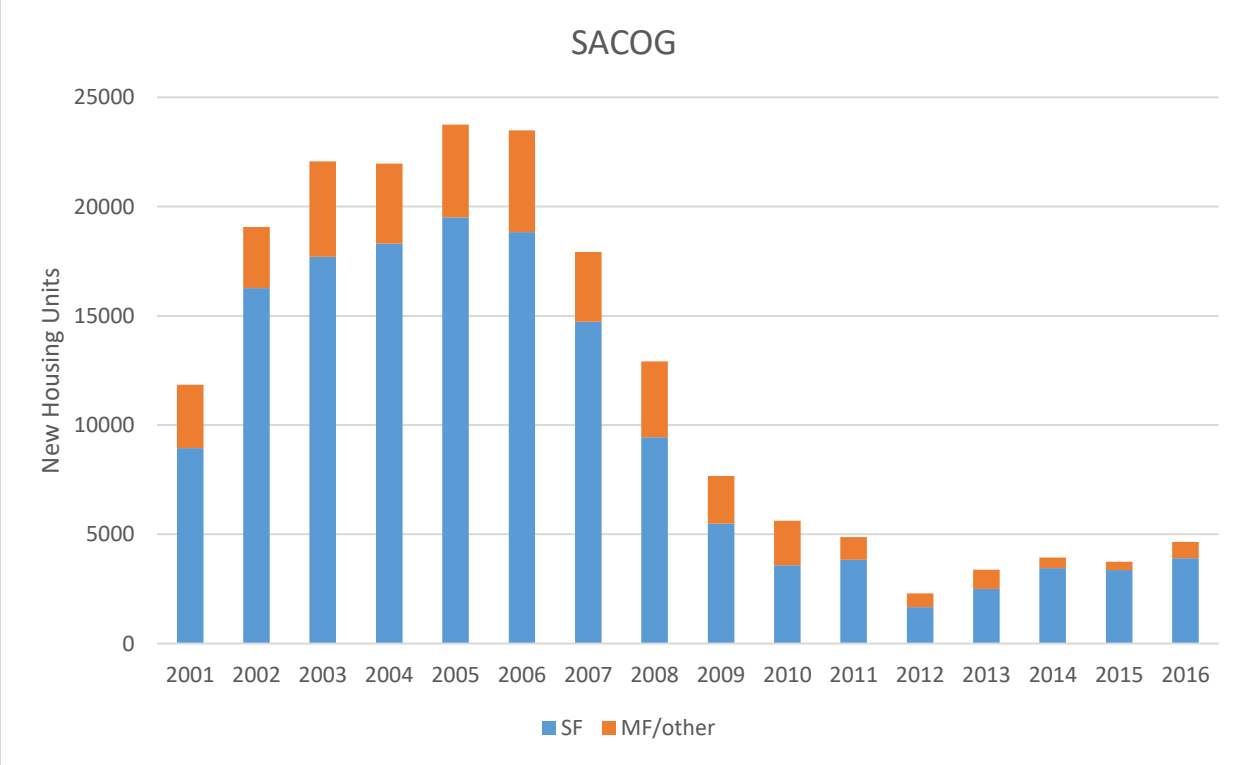
Data Source: DOF



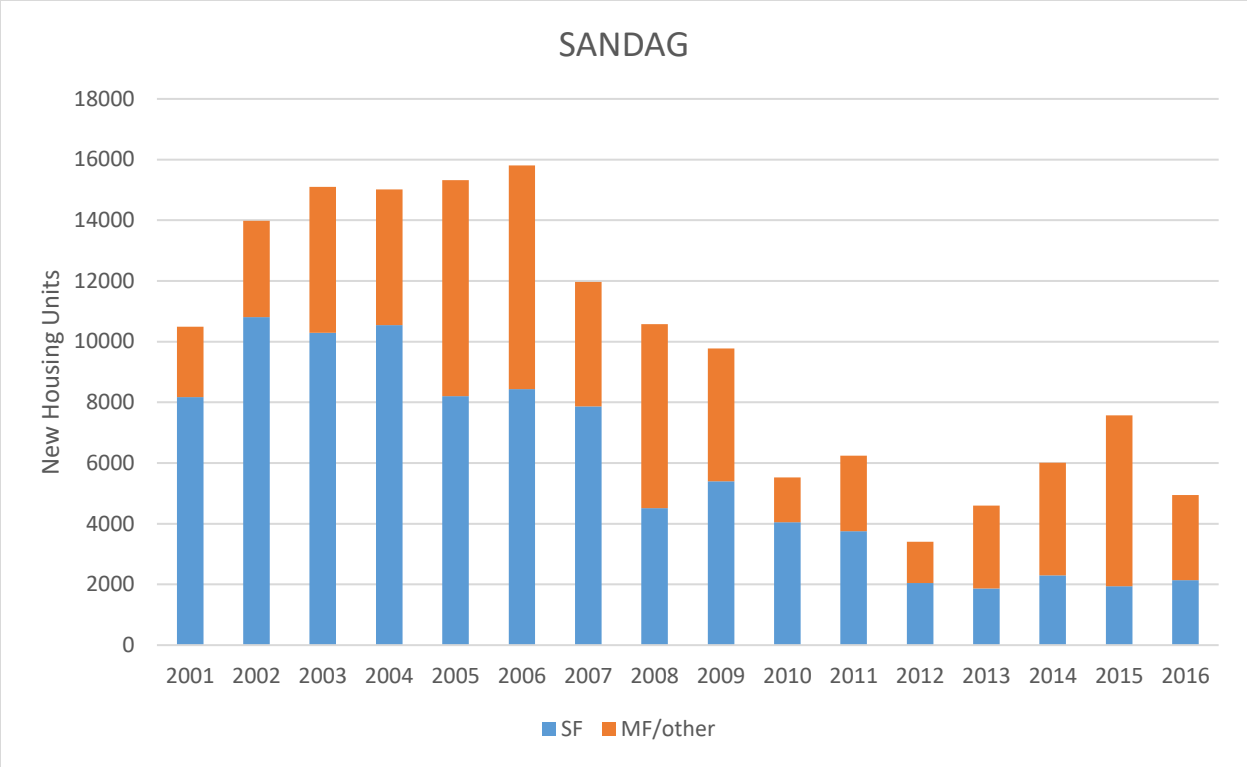
Data Source: DOF



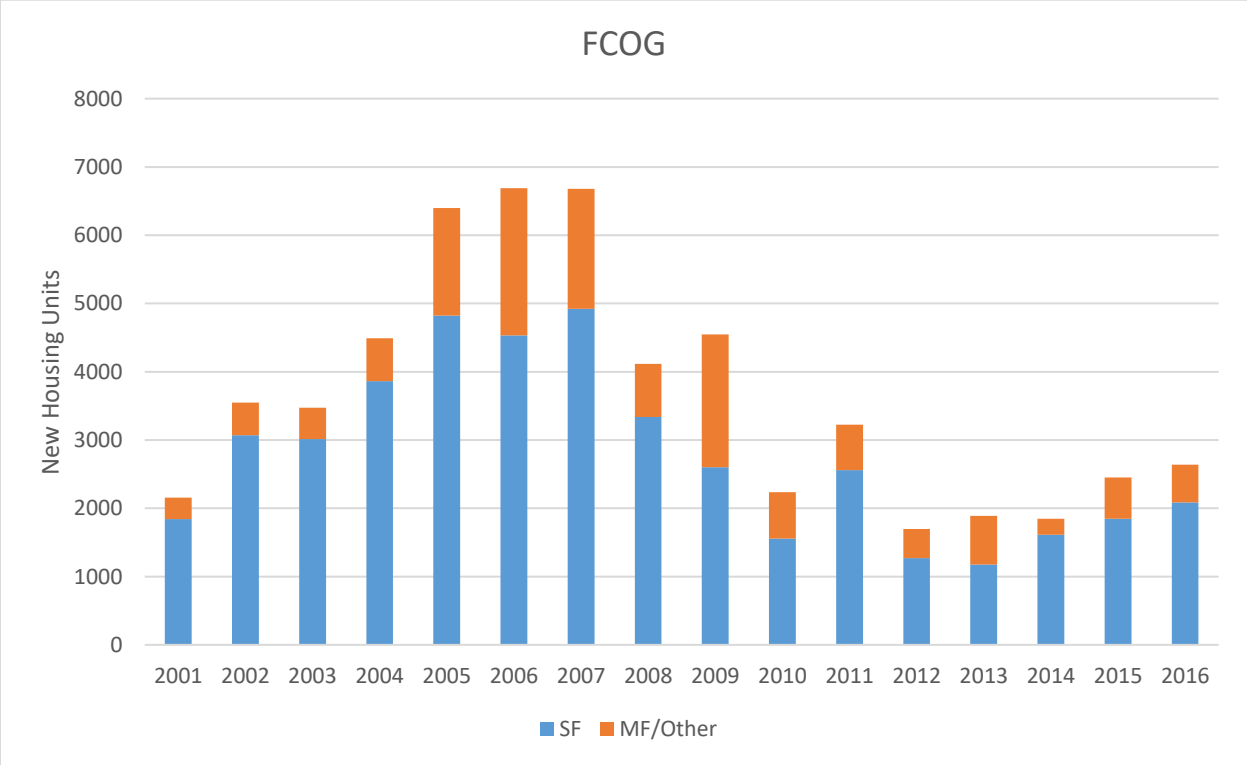
Data Source: DOF



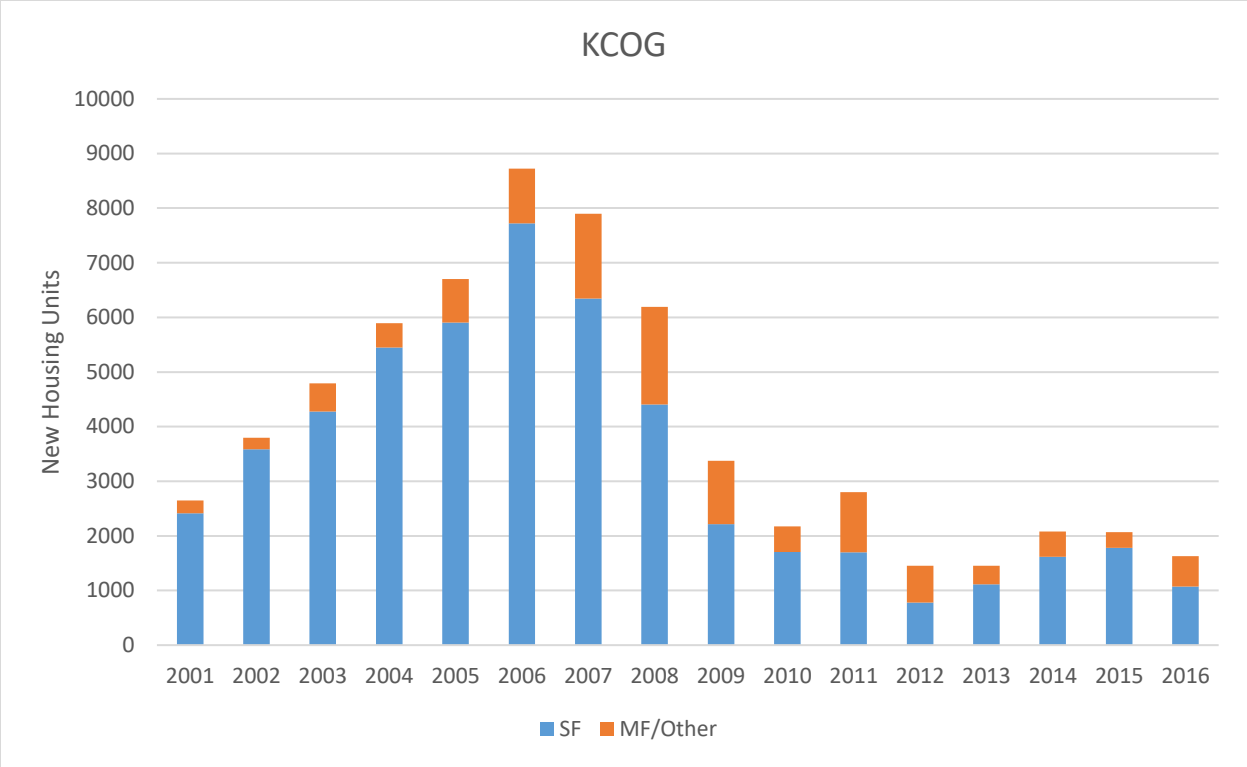
Data Source: DOF



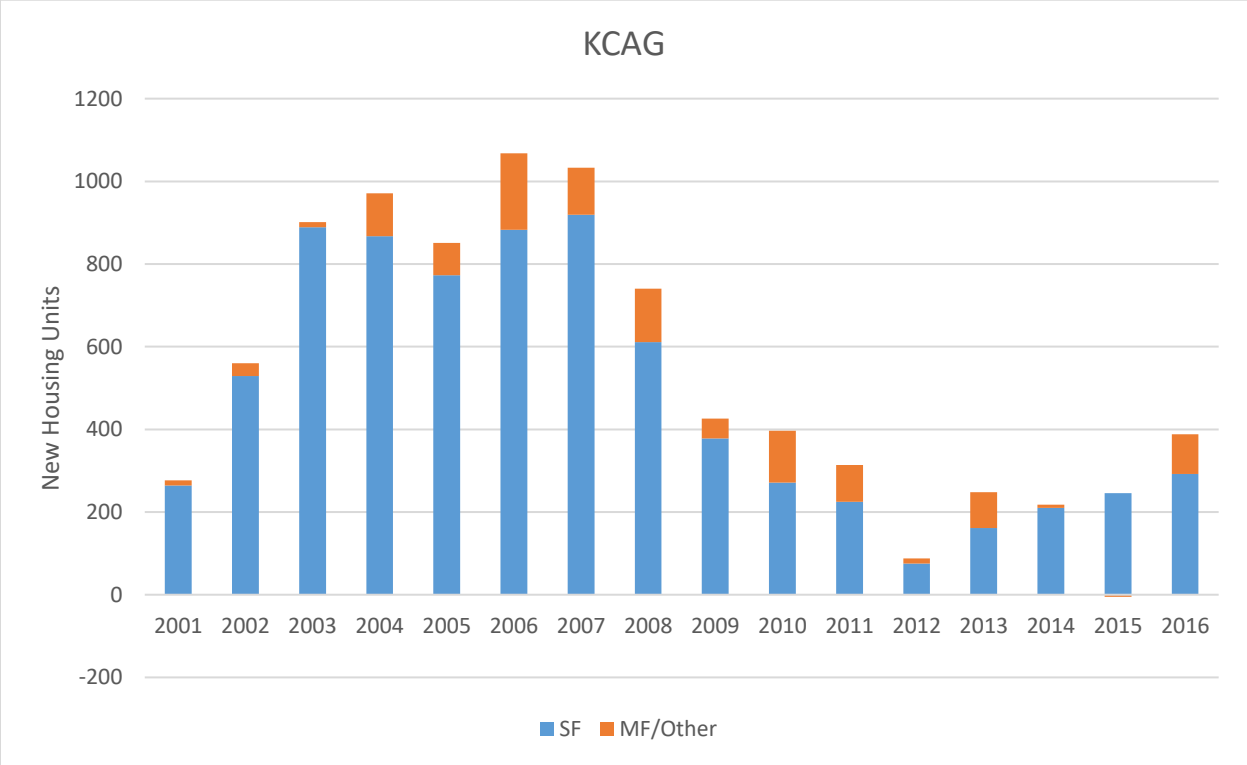
Data Source: DOF



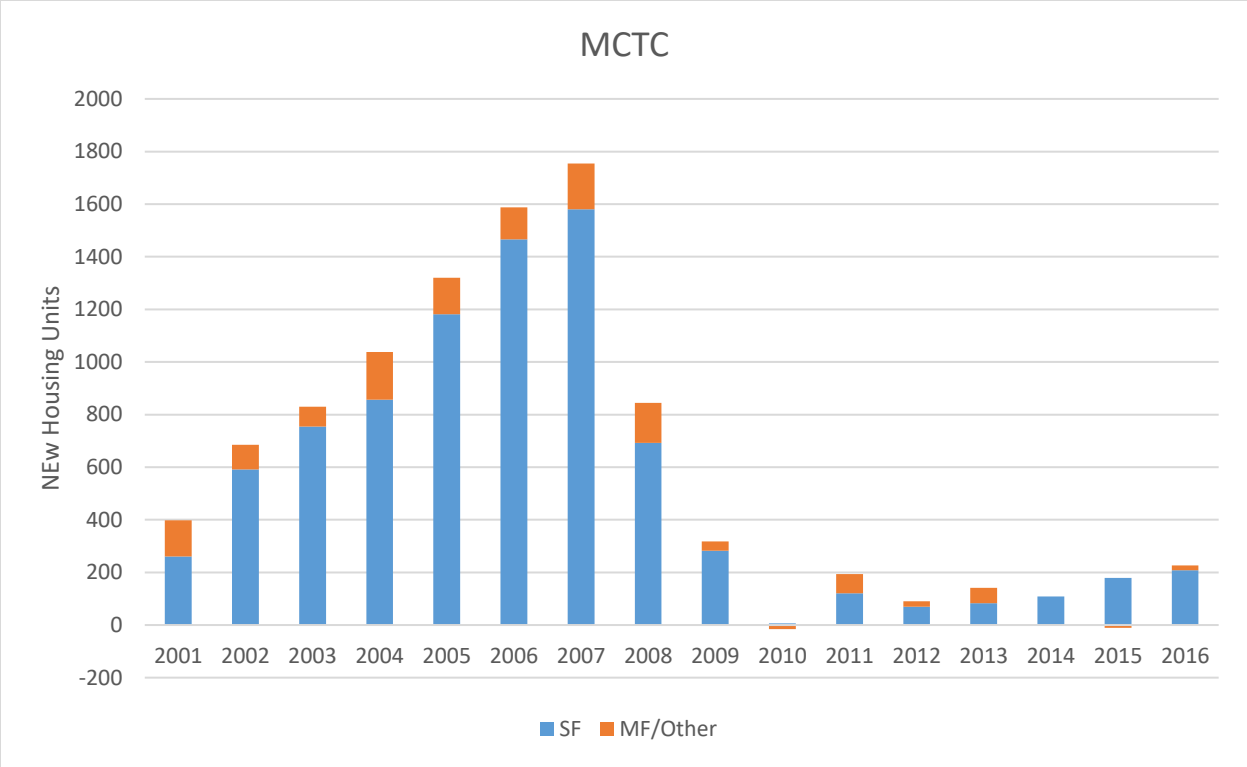
Data Source: DOF



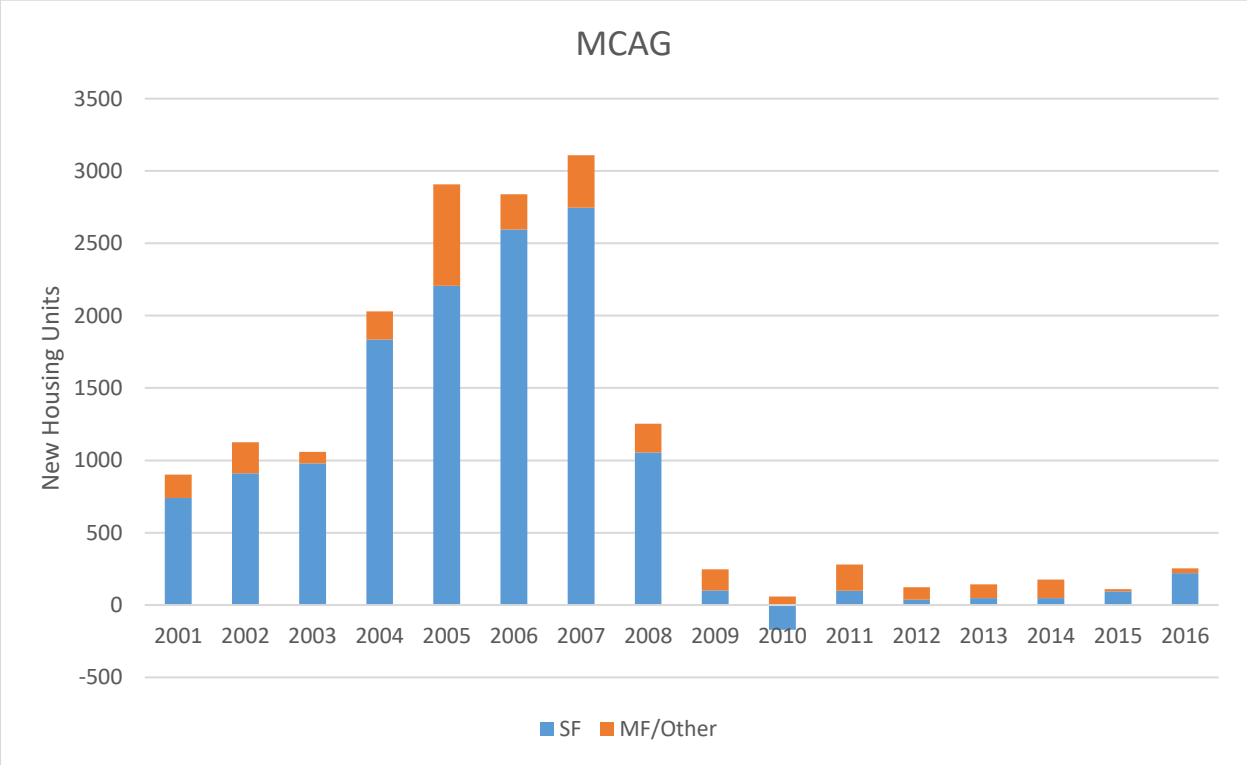
Data Source: DOF



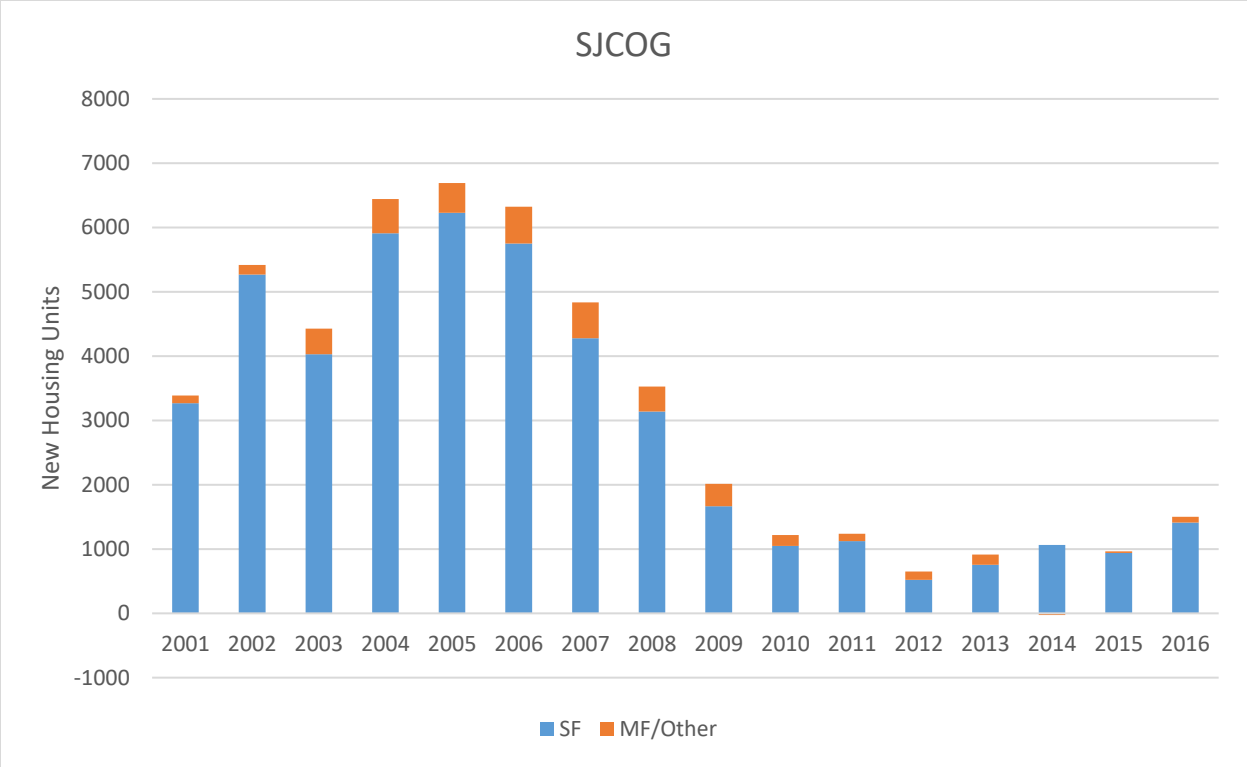
Data Source: DOF



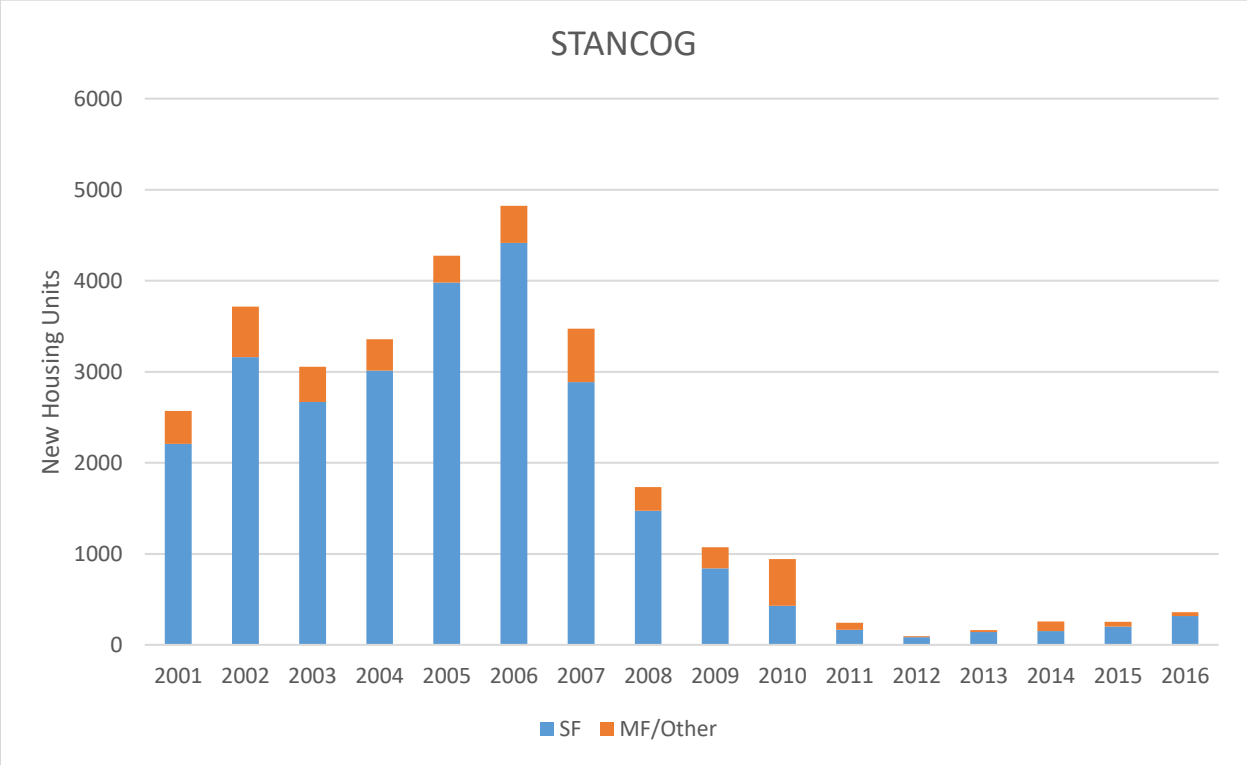
Data Source: DOF



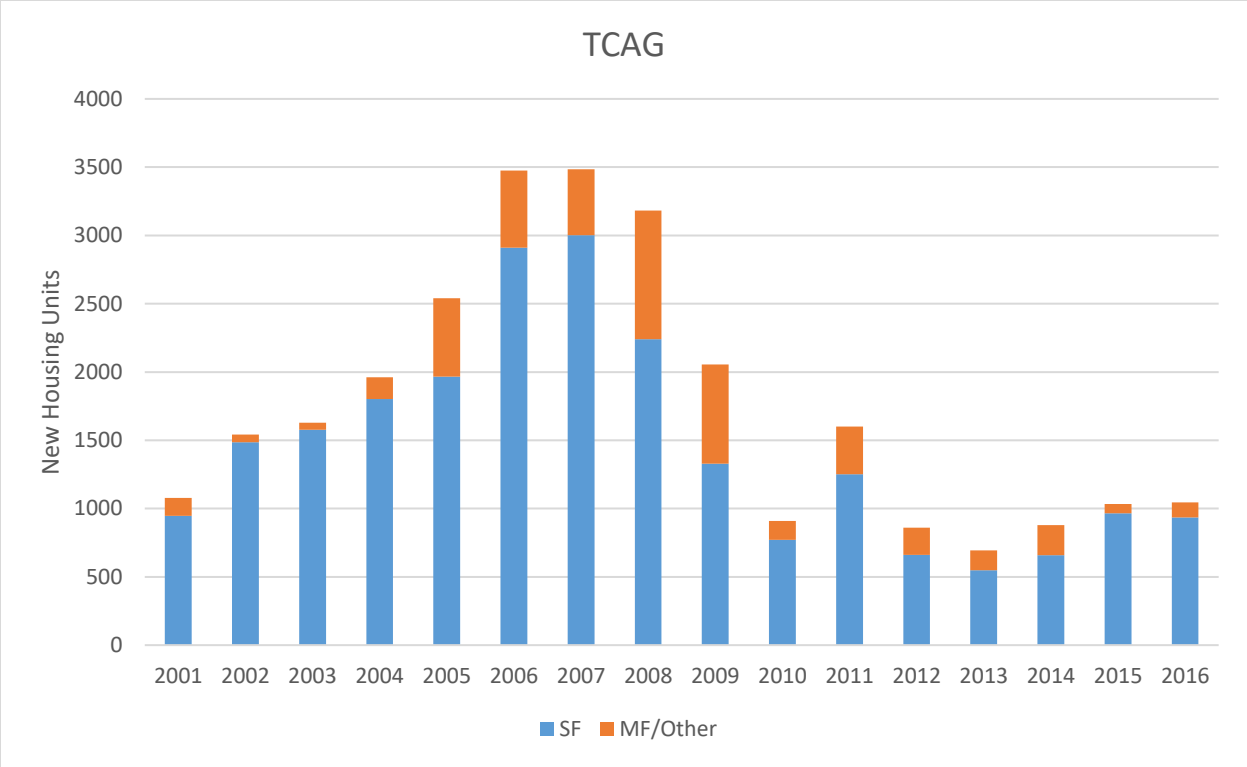
Data Source: DOF



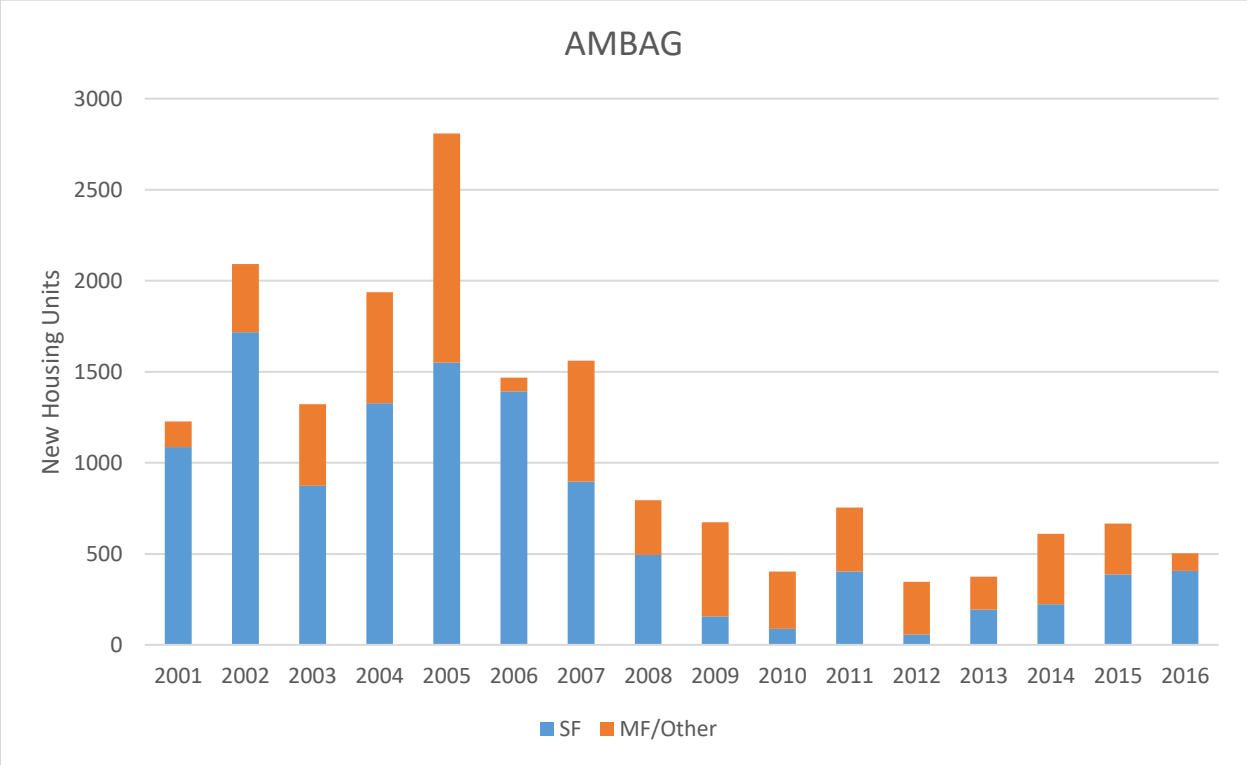
Data Source: DOF



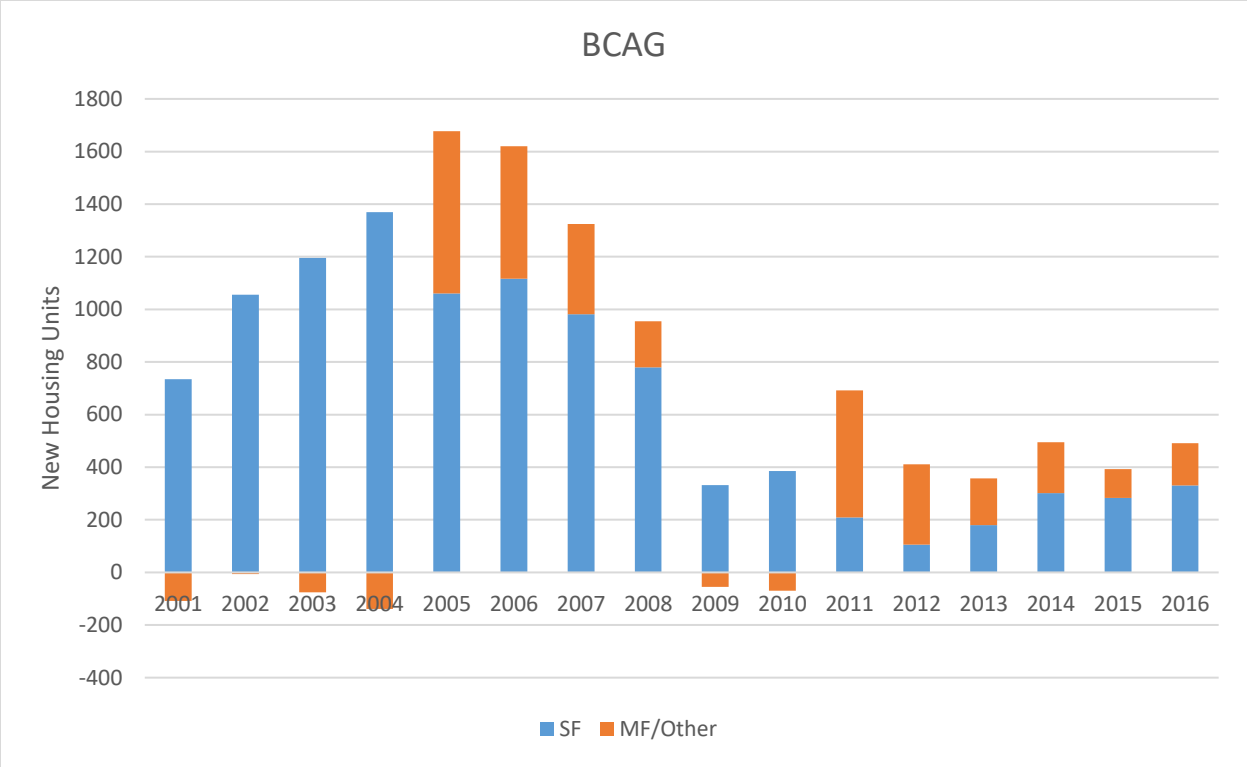
Data Source: DOF



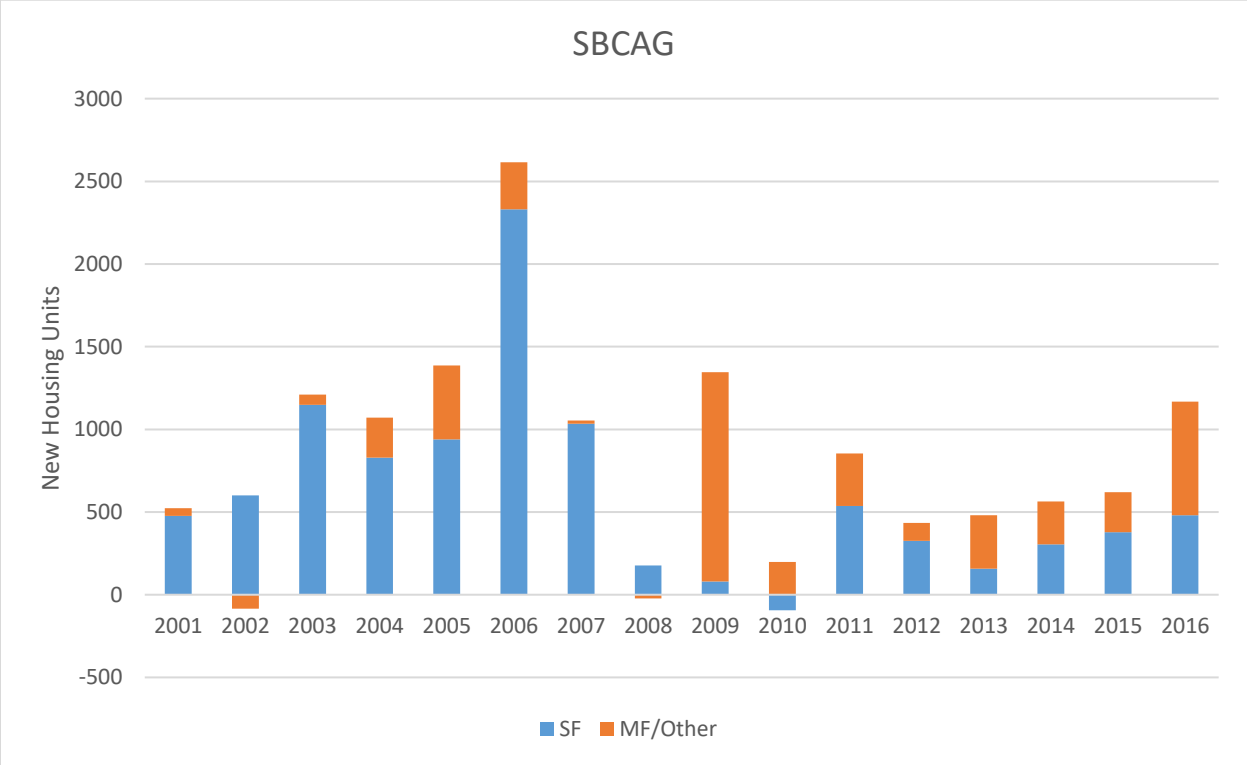
Data Source: DOF



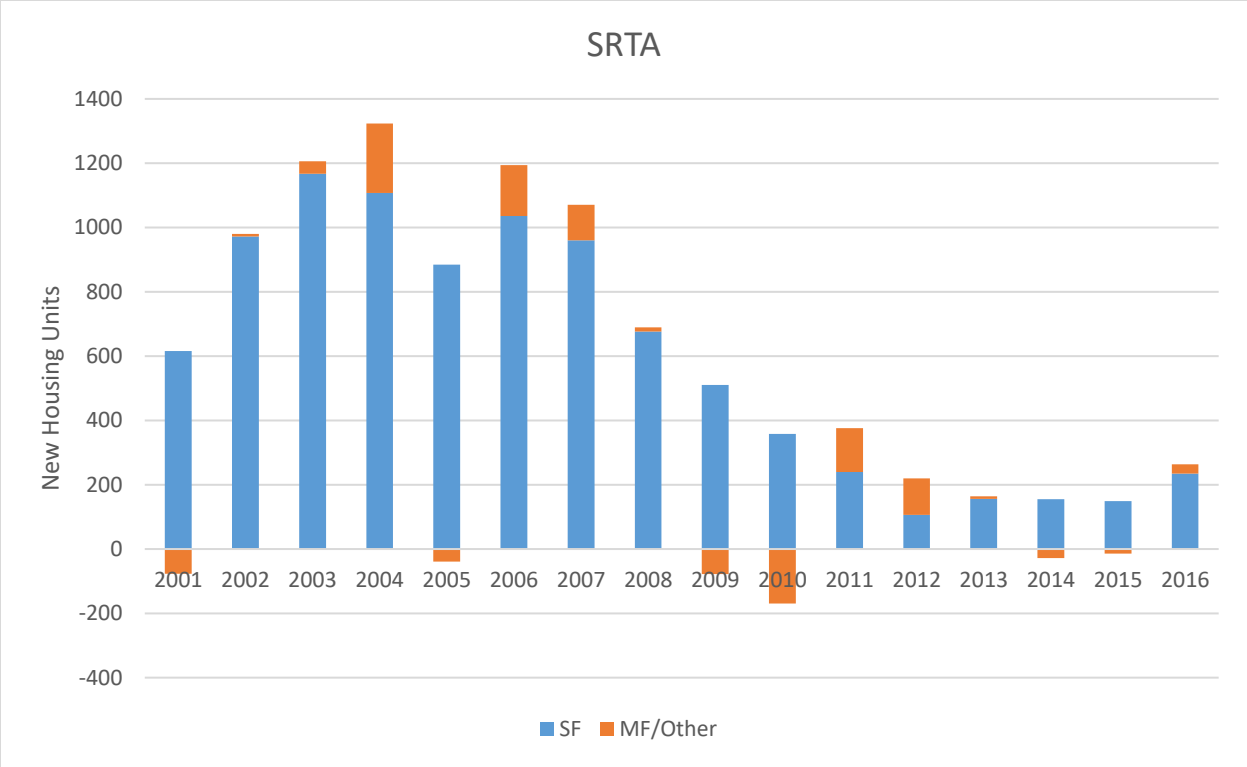
Data Source: DOF



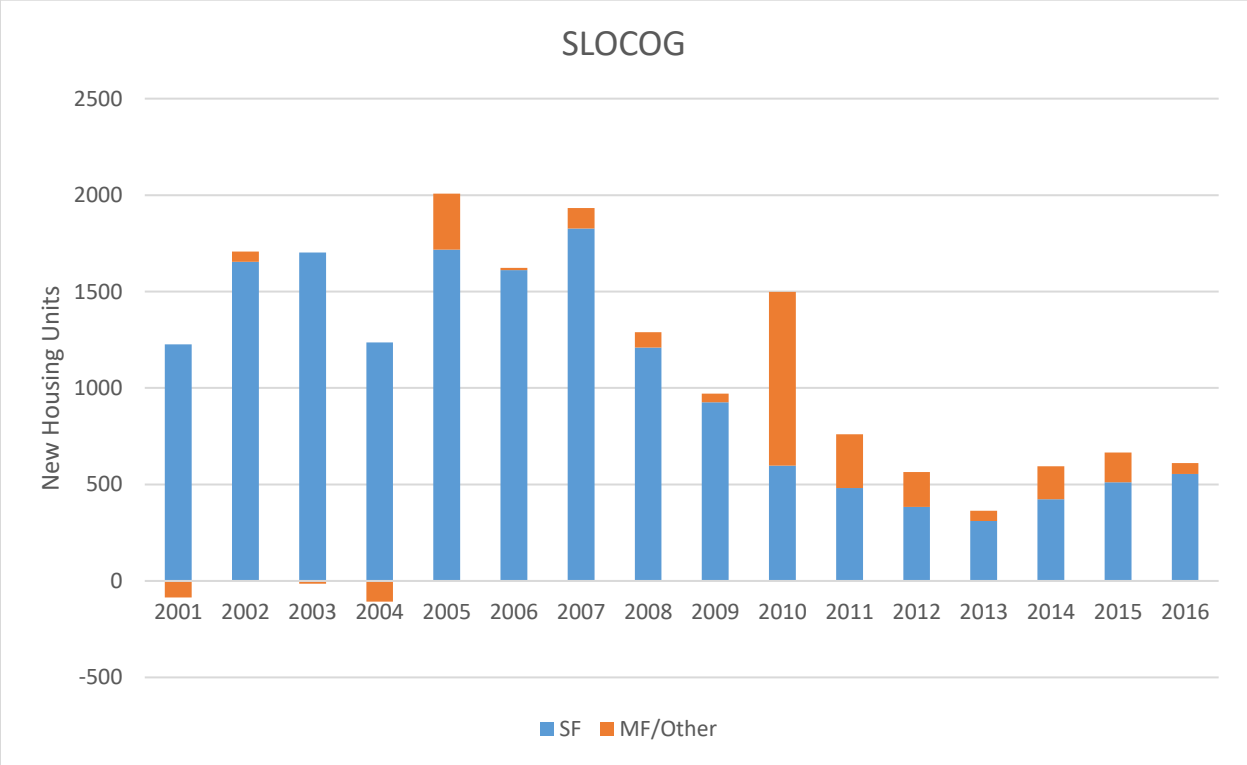
Data Source: DOF



Data Source: DOF



Data Source: DOF

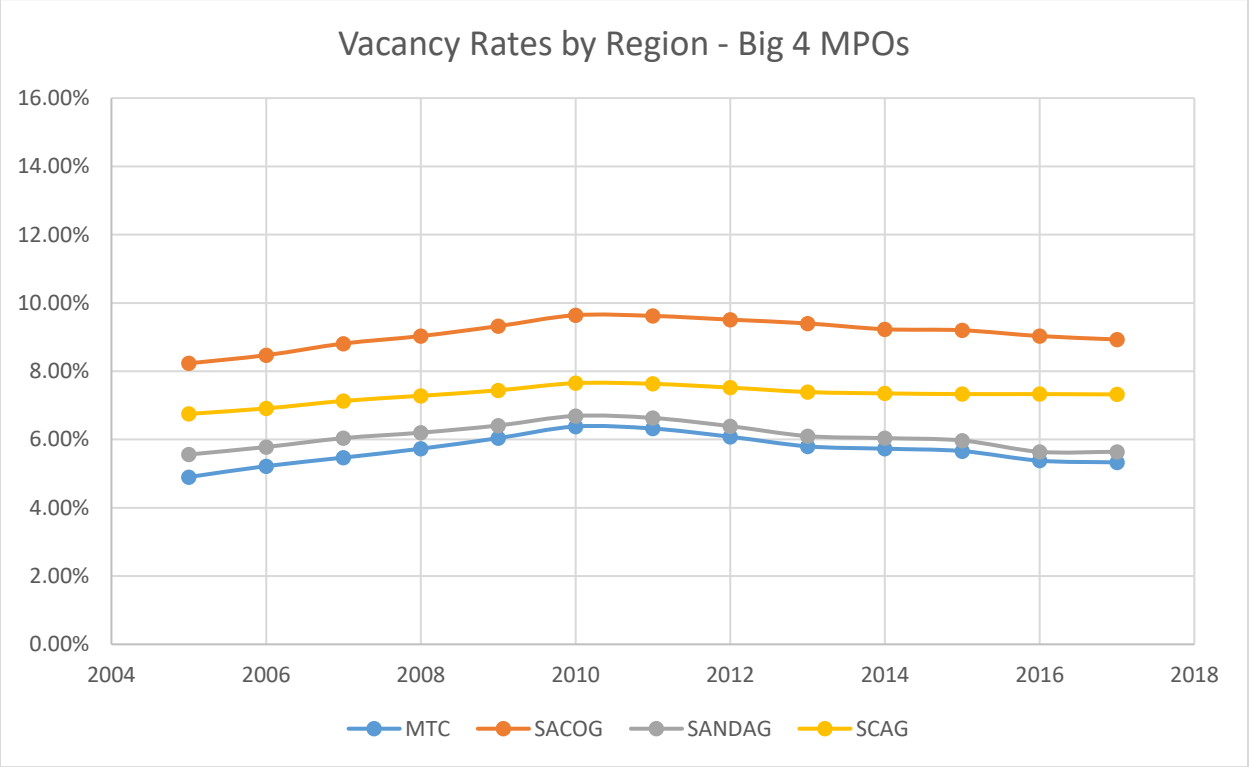


Data Source: DOF

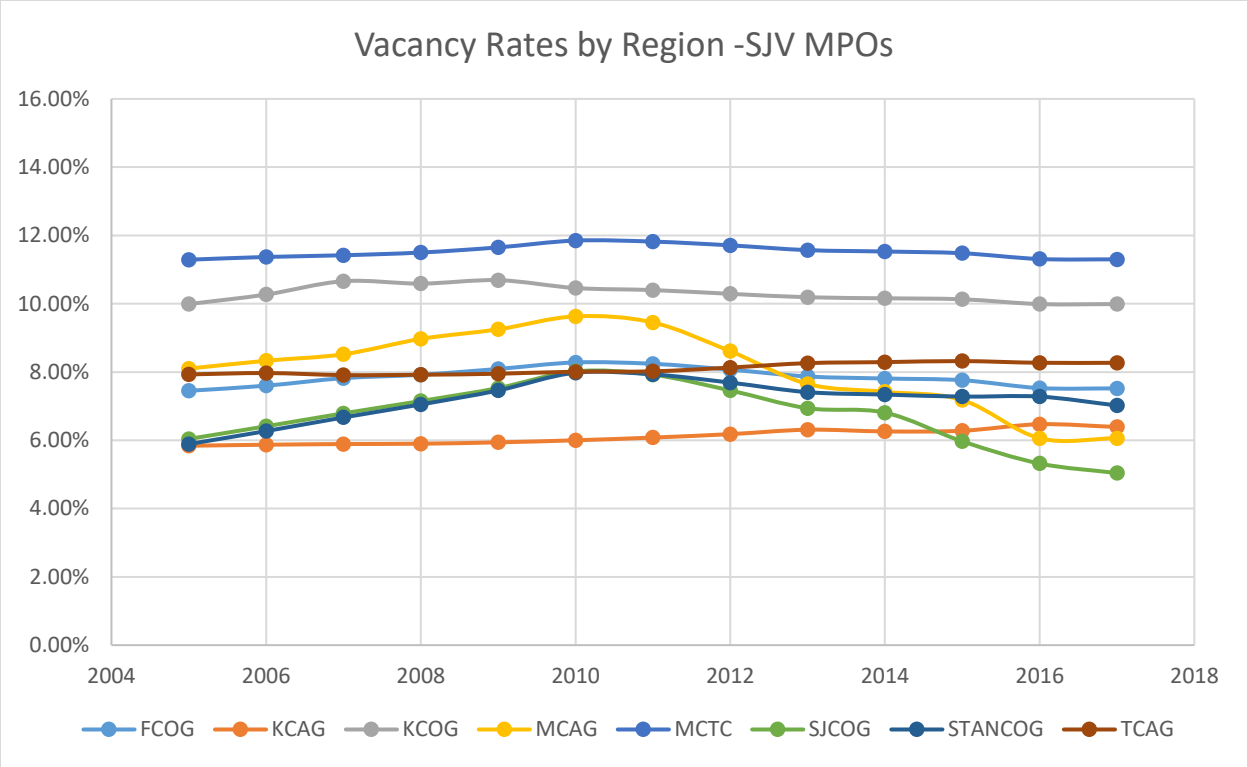
Vacancy Rate

CARB staff analyzed housing vacancy rates by region based on the DOF E-5 (for 2011 to 2016) and E-8 (for 2005 to 2010). A housing occupancy rate was calculated by dividing MPO region household numbers by total housing units from 2005 to 2016. Vacancy rate is 1 minus the housing occupancy rate.

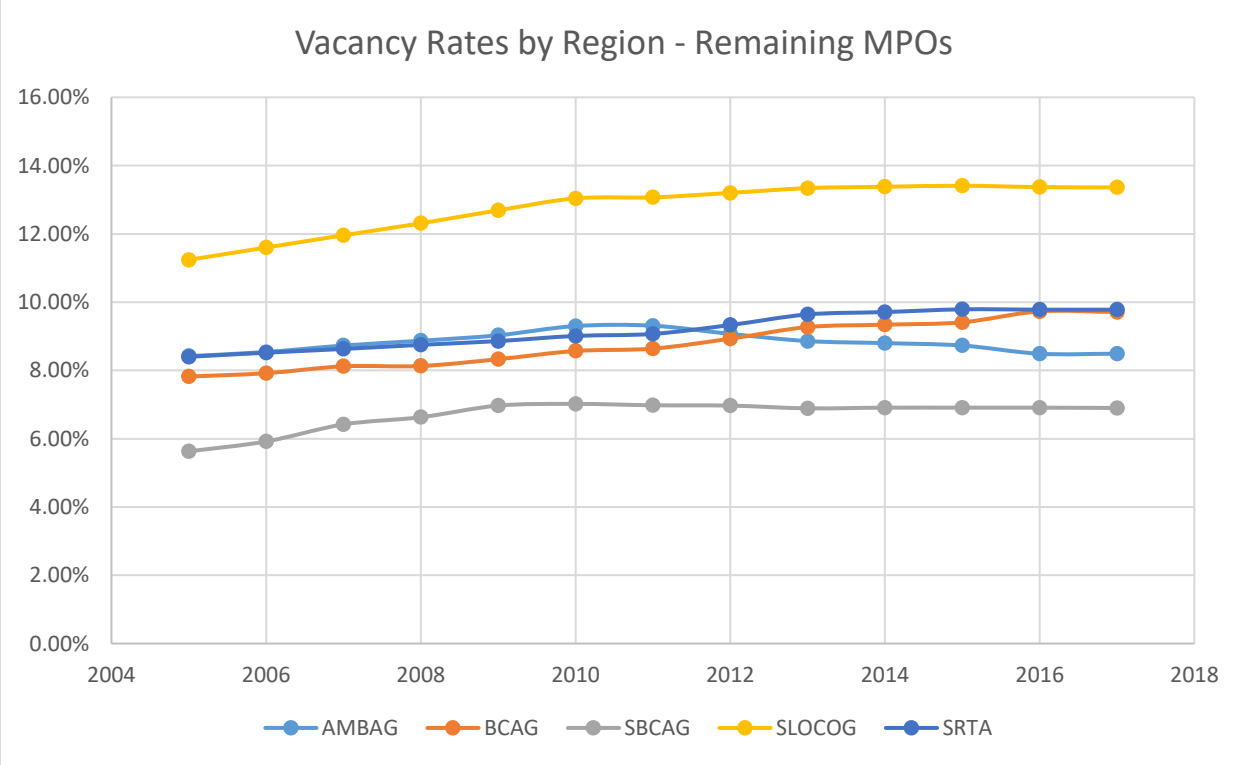
Housing vacancy rates vary by MPO. As shown in the following figures, the vacancy rates in the Big 4 MPO regions increased from 2005 to 2010, and then declined afterwards. The vacancy rate in MTC is the lowest among the Big 4 MPO regions. In the SJV MPO regions, several MPOs shows a similar trend to the Big 4 MPO regions, such as FCOG, MCAG, SJCOG, StanCOG. Of the remaining small MPO regions, only AMBAG's vacancy rate has declined since 2010. In general, MTC, SANDAG, SJCOG, KCAG and SBCAG regions have the lowest vacancy rates in California.



Data Source: DOF



Data Source: DOF



Data Source: DOF

Jobs-Housing Balance

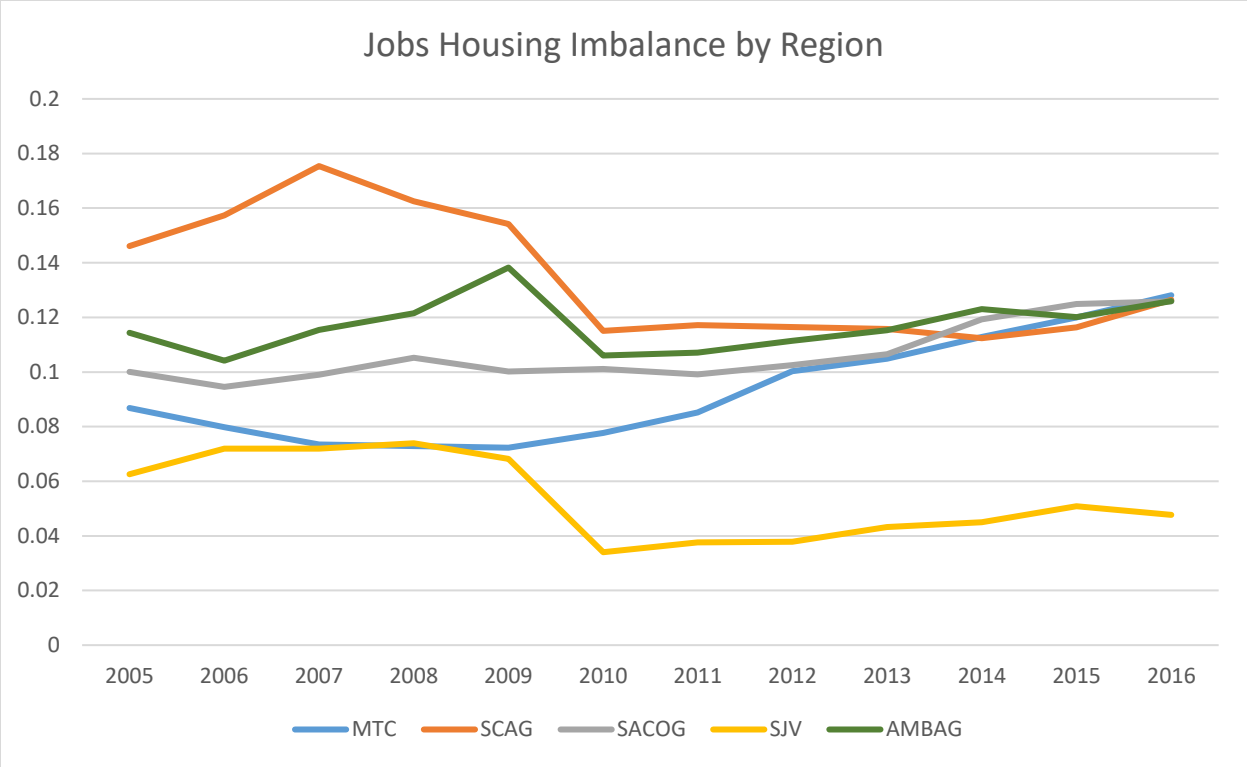
Jobs-housing balance is a parameter that analyzes the distribution of employment opportunities and housing availability across a geographic area. Literature has reported that keeping job-housing balance at the regional level is beneficial to reducing VMT. In this report, CARB staff analyzed the trend of jobs-housing balance in five regions: MTC, SCAG, SACOG, AMBAG, and the San Joaquin Valley (aggregating the eight county area). Due to data availability, CARB staff did not conduct this analysis for all other single-county MPOs.

In this analysis, CARB staff designed a Jobs-Housing Imbalance Index, which shows the relative jobs-housing imbalance level in each region. CARB staff first calculated the regional average and county average employment to household rates (jobs-housing ratio) in the five regions every year from 2005 to 2016. Employment data were collected from California Employment Development Department (EDD): http://www.labormarketinfo.edd.ca.gov/data/unemployment-and-labor-force.html; and household data were collected from DOF. CARB staff then calculated a Jobs-Housing Imbalance Index for five multi-county regions: MTC, SCAG, SACOG, AMBAG, and SJV using the following equation:

$$\text{Index}_{i,j} = \sqrt{\frac{\sum(JHR_{i,j,k} - JHR_{i,j})^2}{n_i - 1}}$$

Note: $\text{Index}_{i,j}$ stands for the Job-Housing Imbalance Index of MPO i in calendar year j; $JHR_{i,j}$ stands for the average job-housing ratio of MPO i in calendar year j; $JHR_{i,j,k}$ stands for the job-housing ratio of county k in MPO i in calendar year j; and n_i stands for the number of counties in MPO i.

As shown in the following figure, the jobs-housing imbalance level in the SJV multi-county region is the lowest among the five regions. The jobs-housing balance level in SCAG has declined in the tested time period, indicating that the jobs-housing ratio is getting more balanced. Data shows that in the MTC, SACOG, and AMBAG regions, the jobs-housing ratios are becoming more imbalanced during the reporting period, especially in MTC.



Data Source: DOF, EDD

Housing Cost Burden

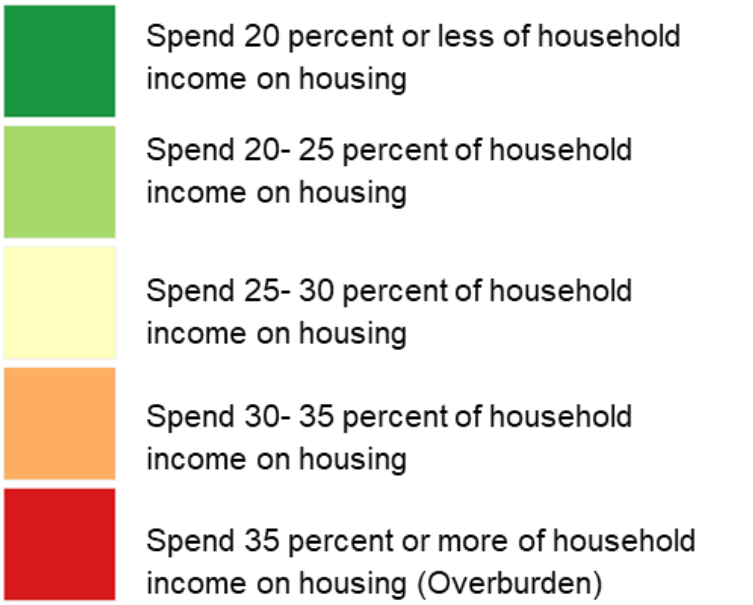
CARB staff analyzed housing cost burden in every MPO, based on the housing cost percentage of household income, looking at changes from 2010 to 2016. CARB staff also analyzed housing cost burden variation across race and ethnicity in response to requests from stakeholders during the development of this report.

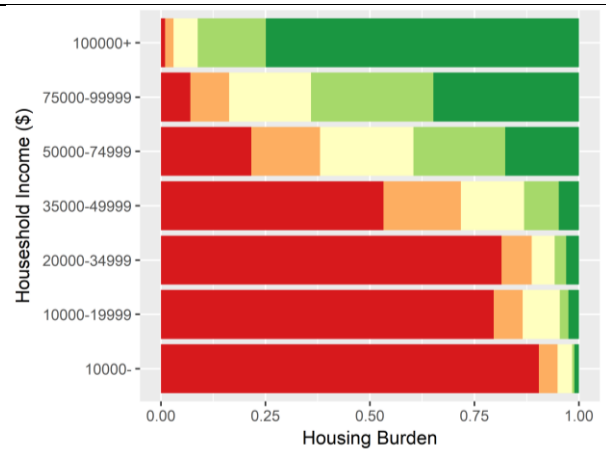
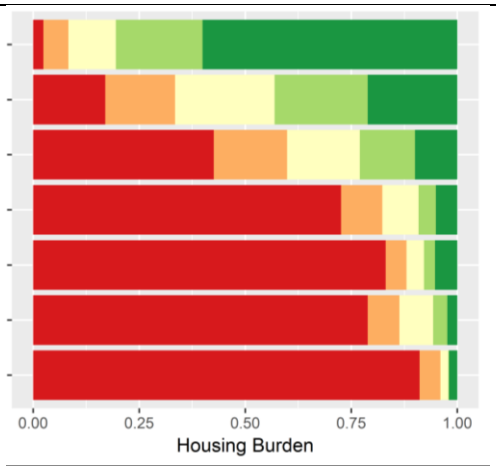
Considering the relatively high average housing cost in California, CARB staff selected a 35 percent of income housing cost as the threshold for defining overburdened in this analysis. CARB utilized county-level ACS 1-yr data in 2010 and 2016, and census tract-level ACS 5-yr data for 2016 in its analysis.

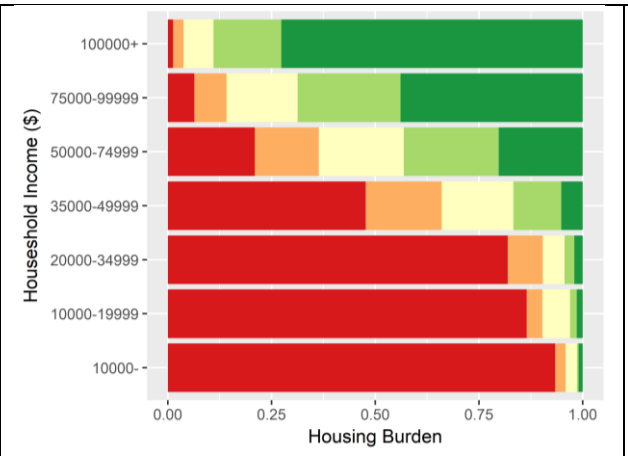
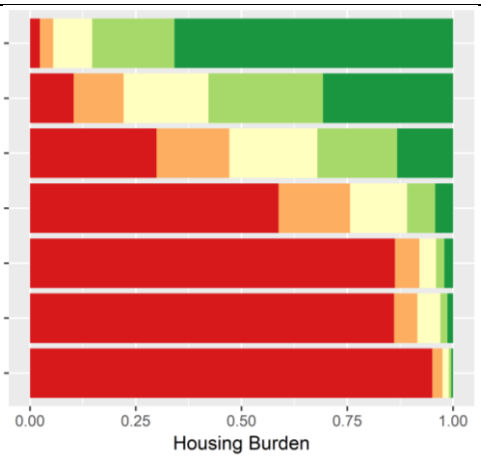
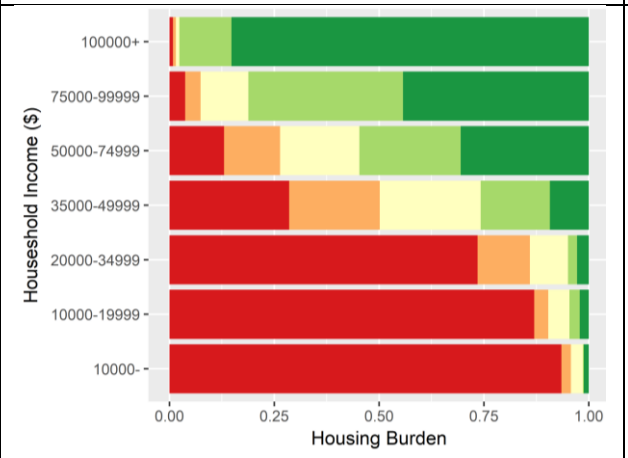
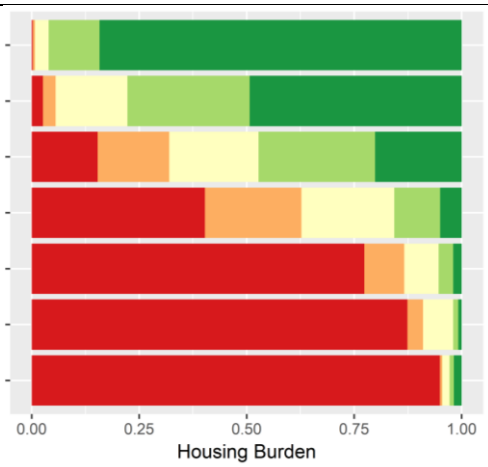
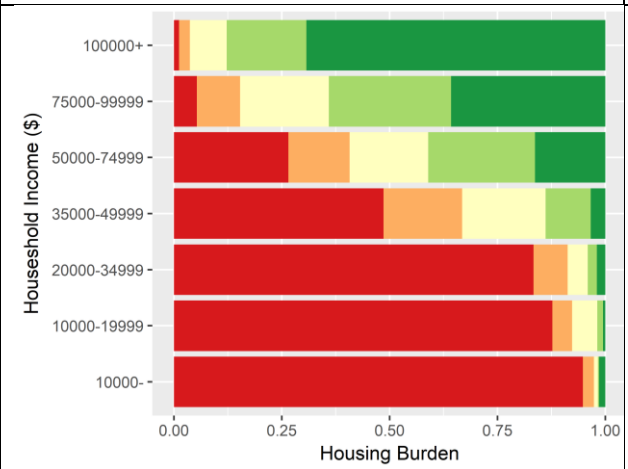
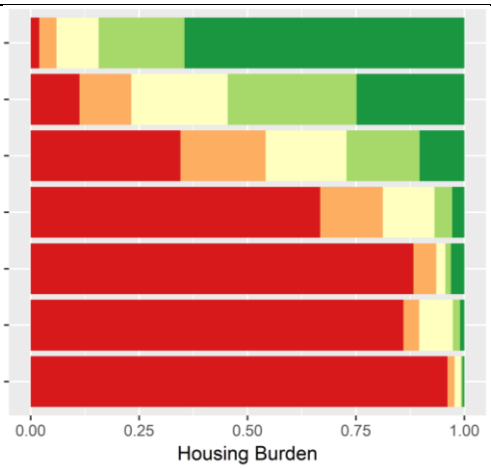
As shown in the figures, more households are overburdened by rent (i.e., spend >35% income on housing) in all Big 4 MPO regions in 2016 than 2010, regardless of income level. In the SJV MPO regions, more households are overburdened by rent in 5 of 6 tested MPOs in 2016 than 2010, regardless of income level. Only SJCOG shows a reduction in the percent of households overburdened by rent in 2016. In the remaining MPO regions, more households are observed to be overburdened housing cost in AMBAG, BCAG, SLOCOG, and SBCAG in 2016 than 2010, especially in the low and moderate income level groups.

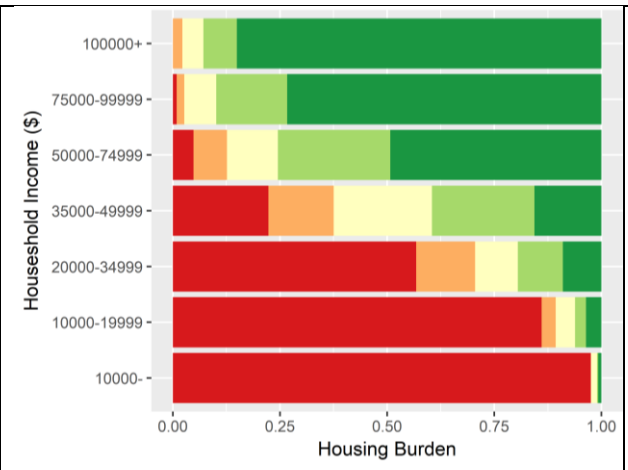
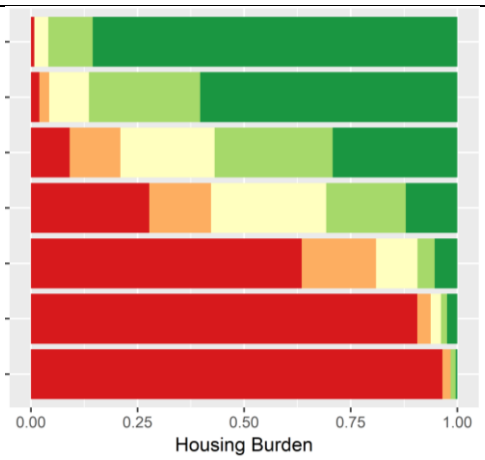
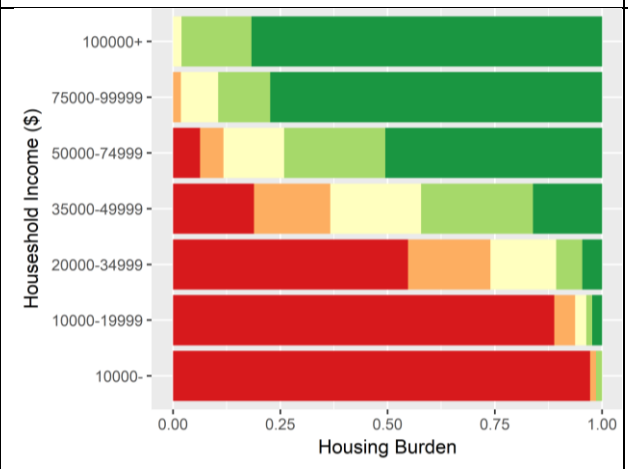
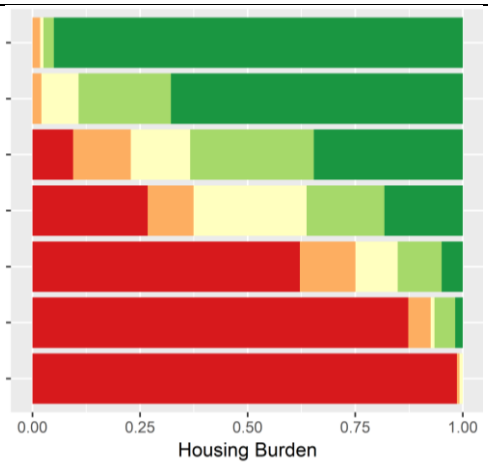
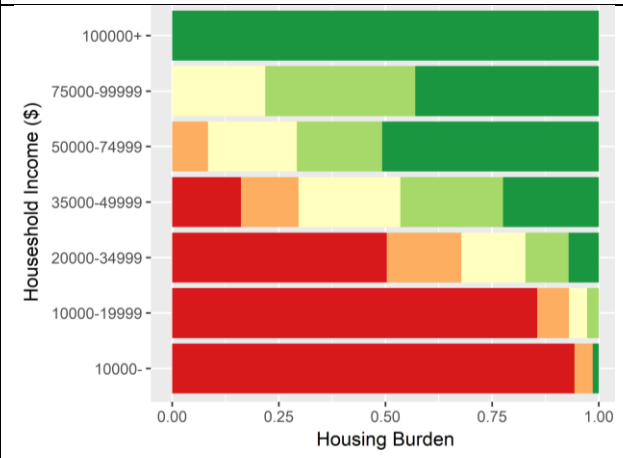
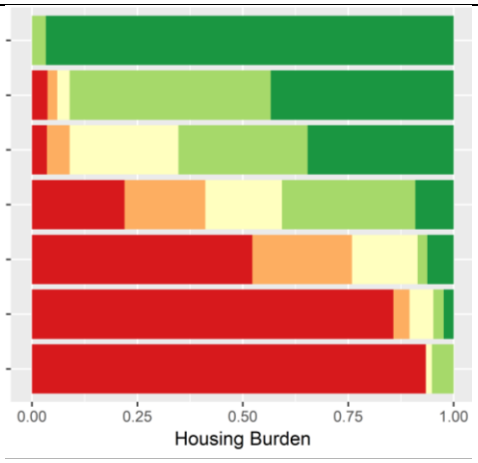
Note: When reading the following charts, a different color represents spending a specific percentage of household income on housing (as shown below). The length of each

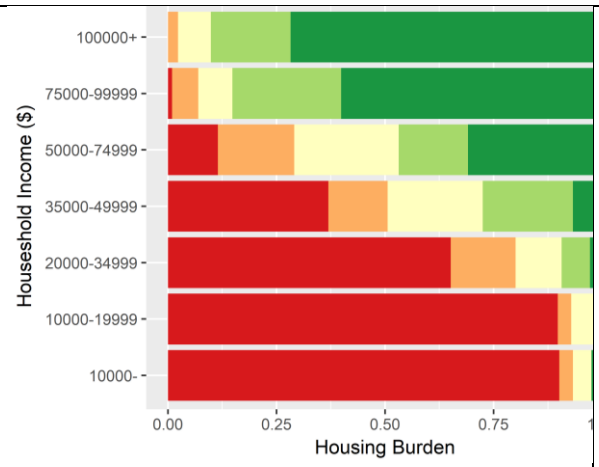
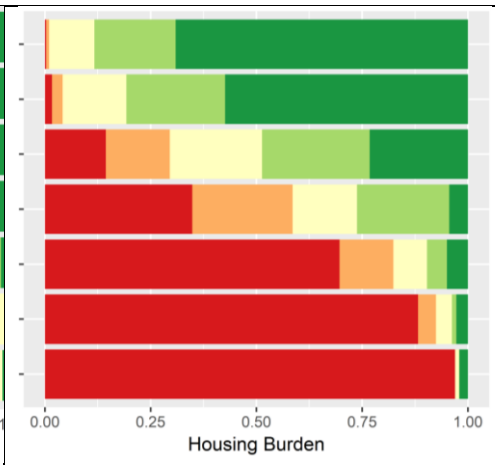
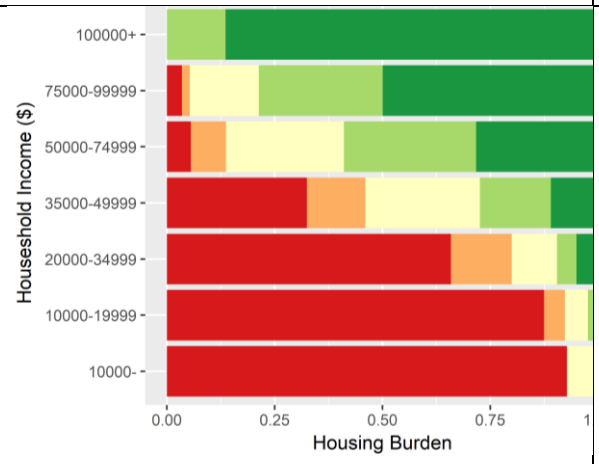
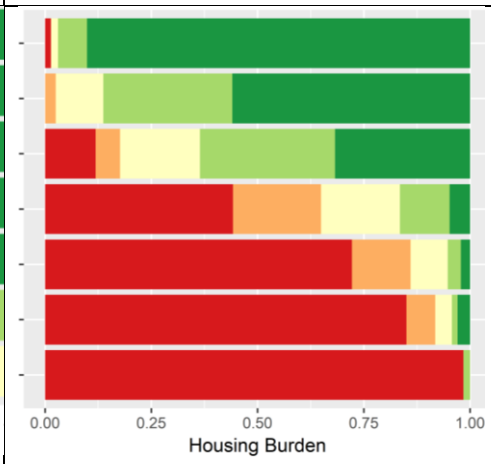
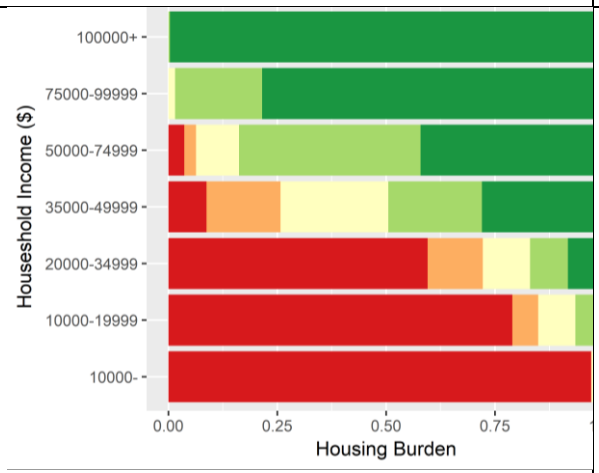
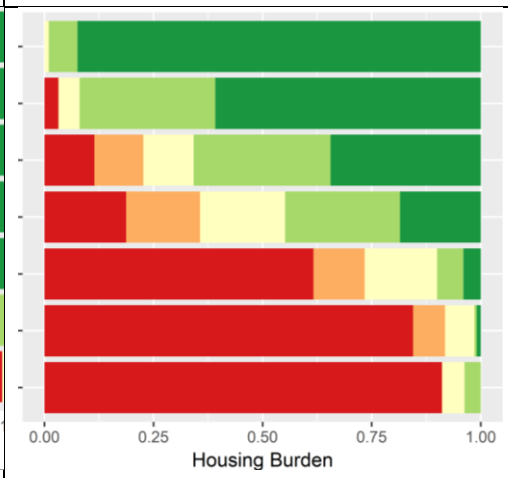
color represents the percentage of households (spending specific amount of income on housing) in a given income group.

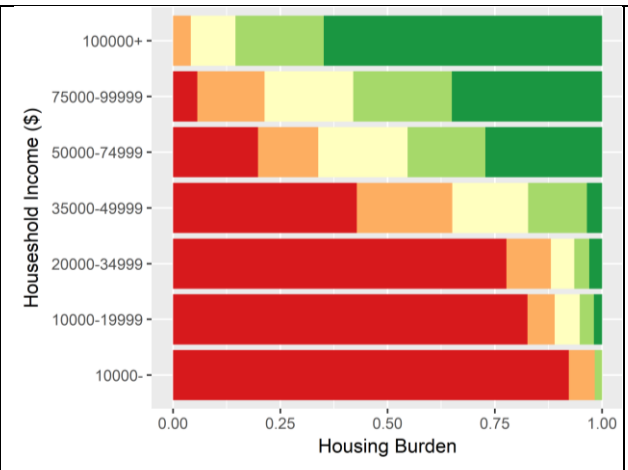
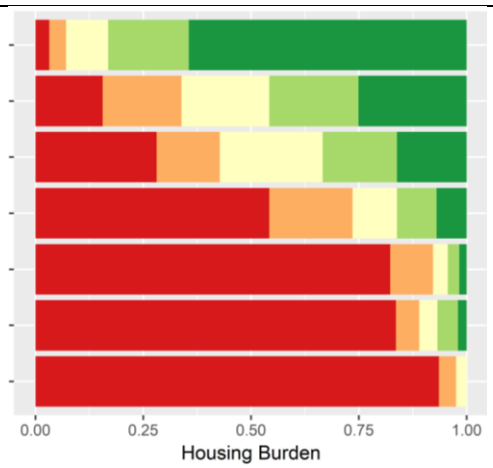
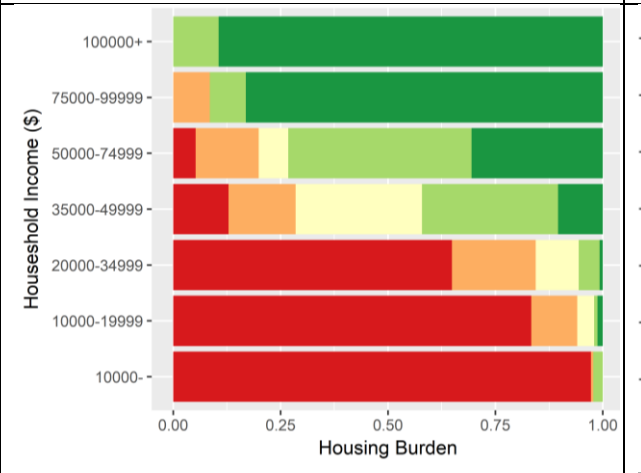
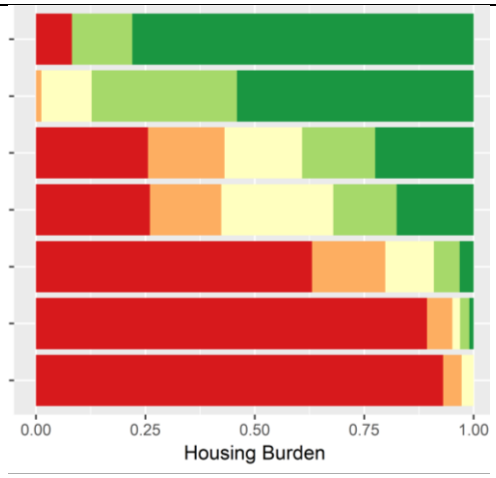
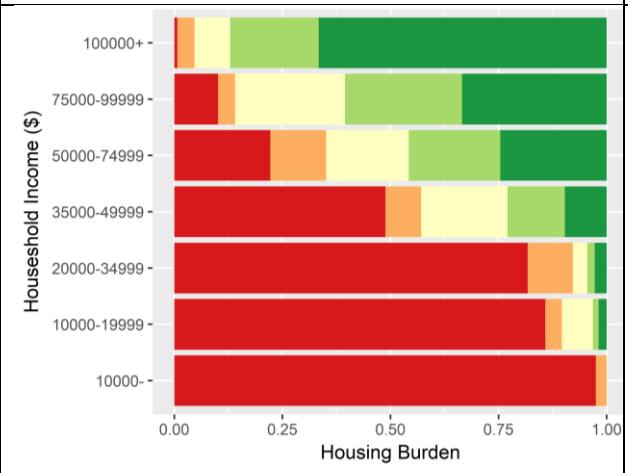
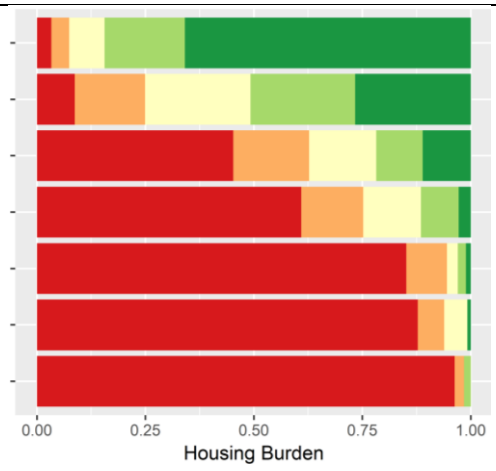


MPO	2010	2016
MTC		

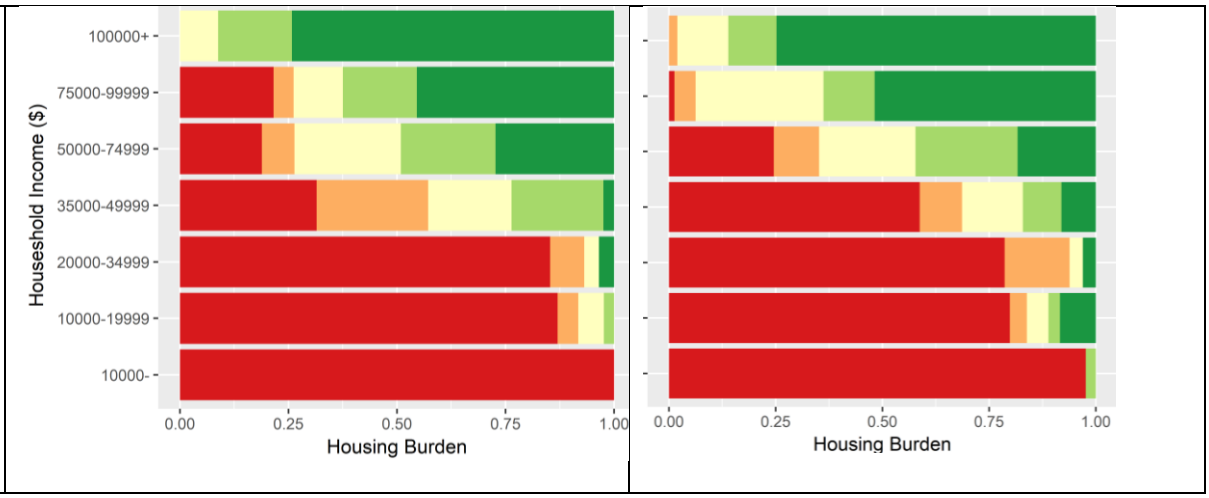
SCAG		
SACOG		
SANDAG		

FCOG		
KCOG		
MCAG		

SJCOG		
STANCOG		
TCAG		

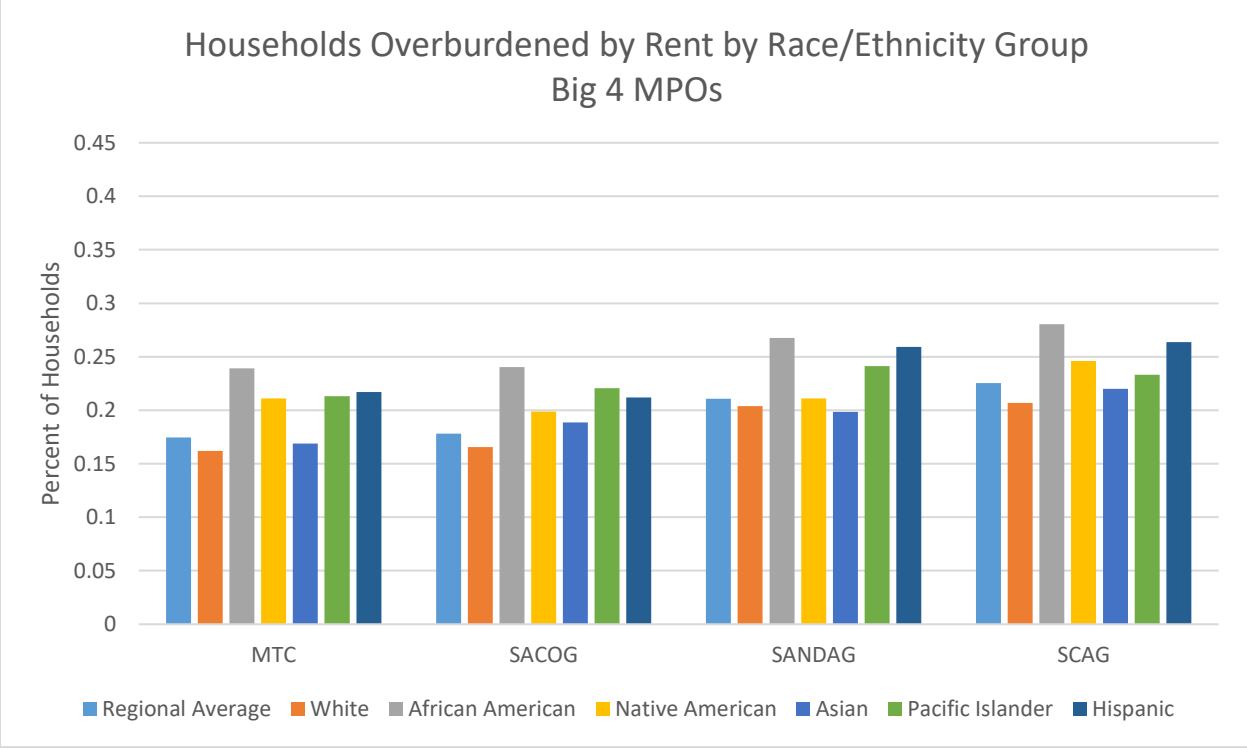
AMBAG		
BCAG		
SBCAG		

SLOCOG

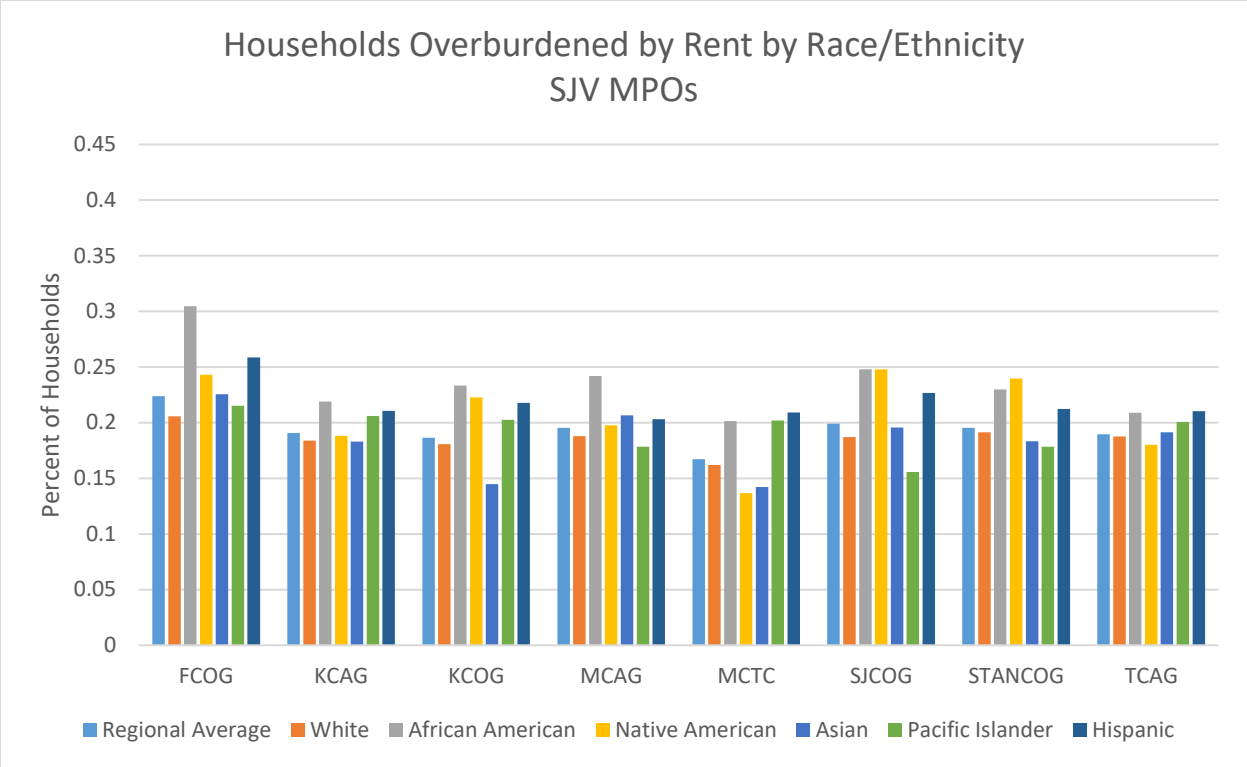


Data Source: ACS

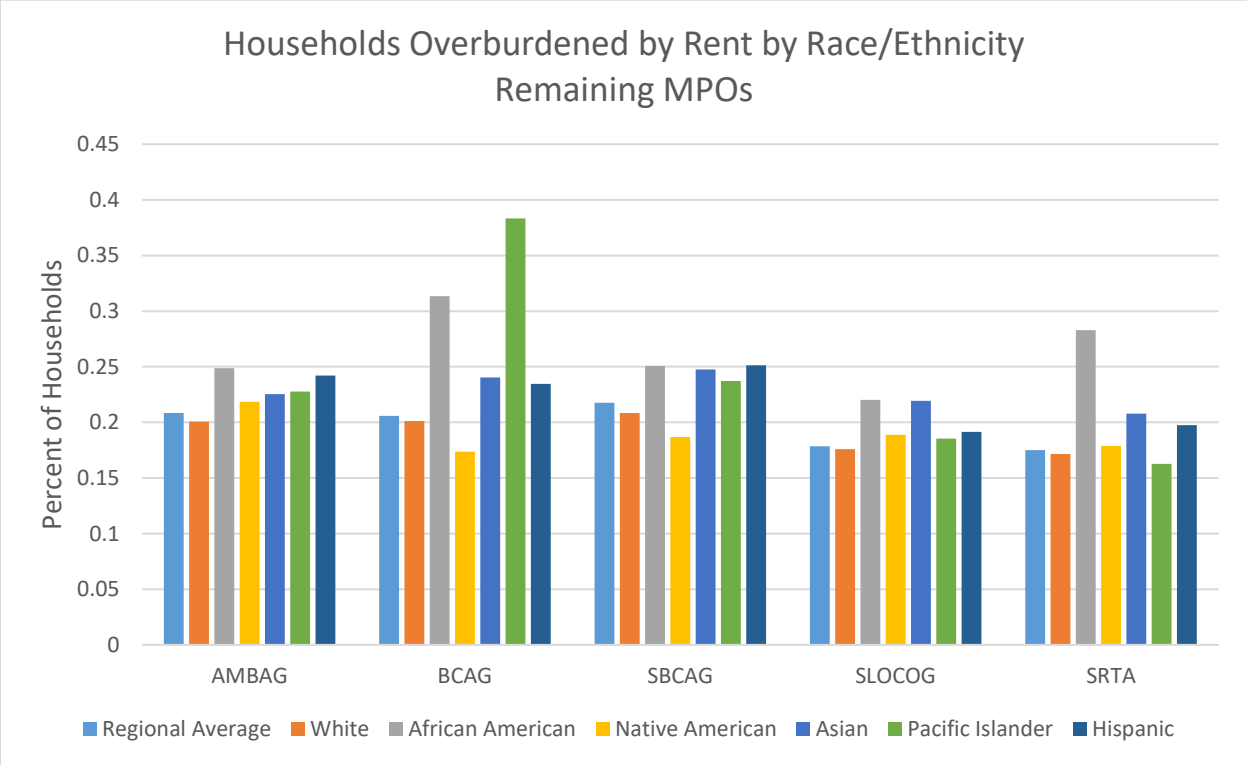
CARB staff further analyzed the percentage of households overburdened by rent by races/ethnicity in 2016. The figures below shows the percentage of households of a specific race/ethnicity overburdened by rent (i.e., spend >35 percent household income on rent) in 2016, compared to the regional average of overburdened households. The data show that African American, Pacific Islander, and Hispanic households are most likely to be overburdened by rent in all MPO regions, while white households are least likely to be overburdened by rent in almost all MPO regions. Native American and Asian American households are also experiencing high housing burdens in some MPO regions, such as SCAG, FCOG, MCAG, SJCOG, AMBAG, SLOCOG, and SRTA.



Data Source: ACS



Data Source: ACS



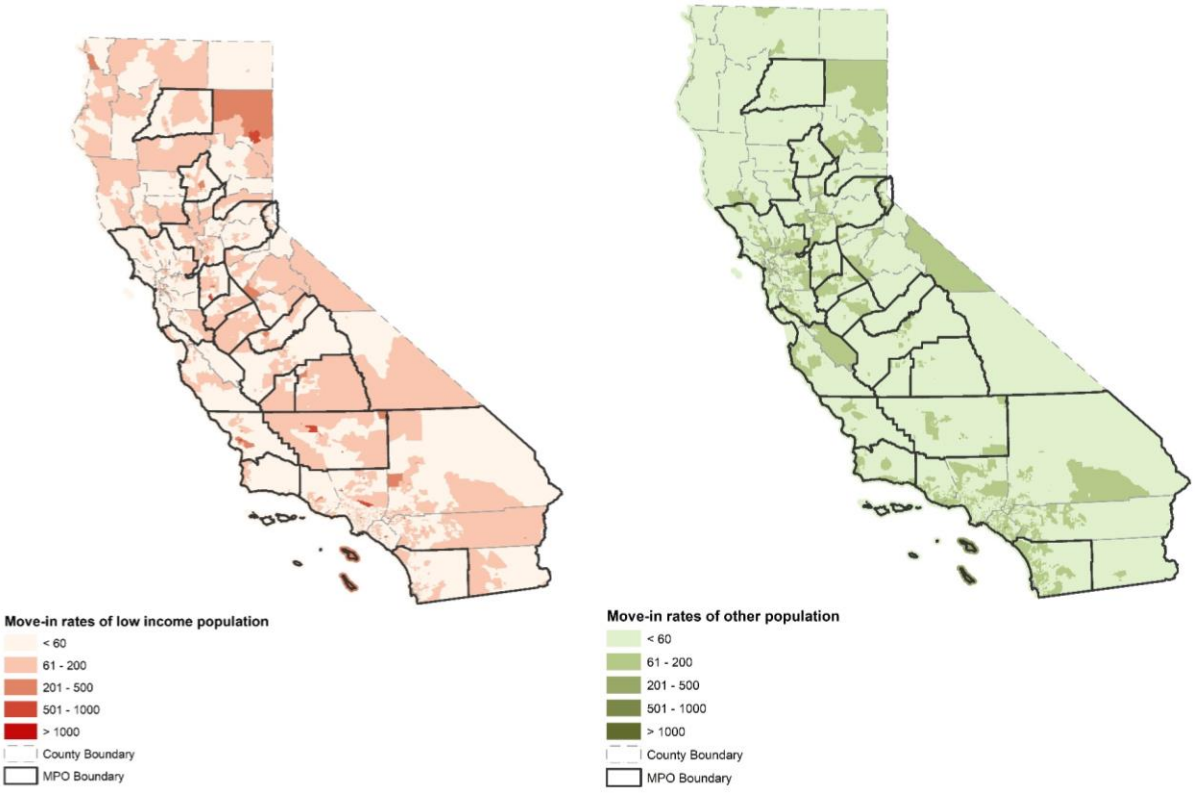
Data Source: ACS

Moving Trends and Displacement Risk within California

CARB staff analyzed the migration of low-income populations within California using ACS data to analyze the annual average move-in population in each census tract from 2010 to 2016, by income group. The average move-in population was normalized by total population in the census tract, to get the move-in rate per 1000 population. Low-income population for this analysis is defined as <$25,000/person, which is the available threshold in ACS closest to the 225 percent of Federal Poverty Level -which is commonly used in other CARB programs.

CARB staff's analysis shows that on average, 71 low-income residents of every 1000 residents move from their homes within California per year. For residents whose income is above $25,000/year, the number is 60. This indicates that California's low-income population is moving more than others in the state

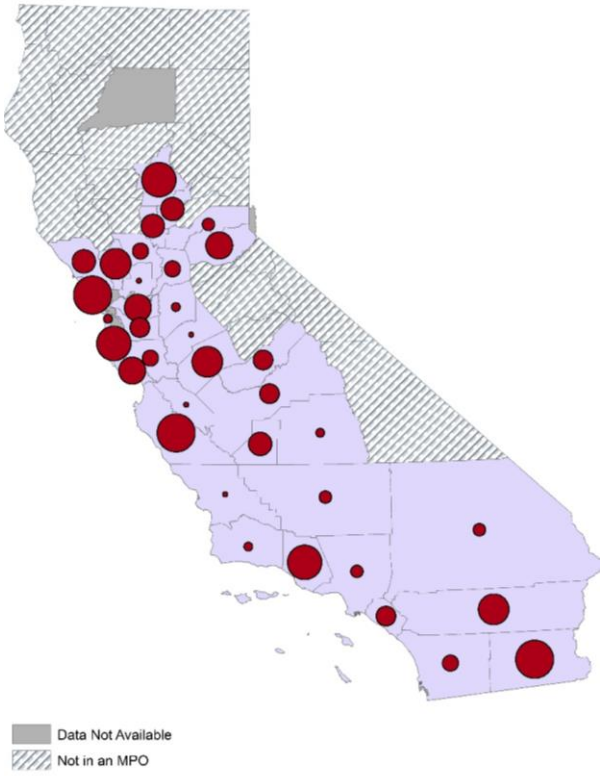
The two maps below show the annual average move-in rate (per 1000 residents) between 2010 and 2016. The result indicates that California's low income population is moving into inland parts of SCAG, SJV, and SJV-MTC boundaries. Not many low-income residents are moving into the MTC region. California's higher income residents are moving towards coastal areas of SCAG and MTC.



Data Source: ACS

In addition to moving trends, CARB staff also calculated displacement risk in California, referring to the method developed through the MTC region's Vital Signs effort. Using this method, displacement risk is calculated by comparing the analysis year (2016) with the most recent year prior (2015) to identify census tracts that are losing lower-income households. Tract data, as well as regional income data, are calculated using ACS 5-year data, given that tract data is only available on a 5-year basis. The analysis first identifies census tracts of greater than 100 households to filter out low-population areas. Secondly, any net loss between the prior year and the analysis year results in the tract level will let that tract being flagged as being at risk of displacement, and the number of lower-income households in that tract are calculated. To calculate the share of households at risk, the number of lower-income households living in flagged tracts are summed and divided by the total number of lower-income households living in the larger geography (i.e., County and MPO). The low-income threshold is calculated based on 225 percent of Federal Poverty Level.

The graphic below depicts the results of CARB's statewide analysis, with larger red circles indicating greater displacement risk. Overall, the analysis shows that displacement risk is most significant in the San Francisco Bay Area. While the displacement risk is also shown to be high in some small counties, CARB acknowledges this is likely attributed to the current calculation methodology's overestimation of risk in counties with a relatively small population compared to the rest of the state.



Data Source: ACS

CARB also undertook a single-year pilot study (2013-2014) to learn more about the travel and auto-ownership patterns of households moving to and away from high-quality transit areas (HQTAs). To conduct this research, CARB utilized California Department of Motor Vehicle (DMV) registration data. Vehicles' registration addresses were compared to "High-Quality Transit" census tracts, defined by SB 827 (2018) and the Affordable Housing & Sustainable Communities program in 2016, to determine whether vehicle owners moved into or away from transit areas. When a vehicle's registration shifted into or away from an HQTA, CARB also examined the total number of cars registered to that address and the odometer data that accompanies smog checks (primarily for vehicles older than six years) to consider how vehicle ownership and travel patterns compared between these sets of households.

From 2013 to 2014, the data appeared to show a net migration of car-owning households away from high-quality transit areas. However, this research relied upon DMV data, and therefore could not detect households that did not register any cars, making it also possible that zero-car households are counterbalancing the households that are moving away from transit. Statewide, for every 100 car-owning households that moved out of a HQTA, only 95 moved in.

The car ownership patterns of households that moved away from and into HQTAs are different. Although the distribution of car ages in these two sets of households was very similar, vehicles in households that had moved from HQTA accrued 75 million more annual miles in subsequent years than those that moved to HQTA. This was both because there were more vehicles owned by households moving from HQTAs (that have odometer readings from smog checks), and because these vehicles traveled an average of 182 more miles per year. This increase in VMT for households moving from HQTAs was greater for older cars: cars less than 5 years old travelled 47 more miles per year on average, those 10 to 15 years old travelled 198 more miles, and those 20 to 25 years old travelled 519 more miles than those moving to a HQTA.

Households that moved to and from HQTAs were also distinct in their tendency to change their total number of cars. More households who left a HQTA added cars than did households who moved to a HQTA. The households that moved to transit reduced car ownership more than the households moving from transit, despite being fewer in number.

This research could not detect which of the moving households were displaced. Households may move voluntarily for a variety of reasons, such as a desire to live in a different school district or because of a job change. However, those who moved away from transit and added cars drove more miles than the average car owner, and this difference increases with car age. This data pattern does not contradict a thesis that some portion of the households moving away from transit moved to less-convenient locations and are now commuting longer distances due to economic displacement.

Percent of Jurisdictions with a Certified Housing Element

The Housing Element Compliance Report published by California Department of Housing and Community Development (HCD) provides the status of local jurisdiction certified housing elements in California. Based on this report, CARB staff analyzed the percentage of local governments with an adopted element that is in compliance with the State's housing element law in each MPO.

At the state level, HCD reports that 88.9 percent of local jurisdictions have a certified housing element, as shown in the following table.

Current Housing Element Status Report

Summary for All COG's

Total Jurisdictions = 540

Element Compliance Status	Conditional	%	Draft	%	Adopted	%	Total	%
IN	3	75	5	12.2	472	95.35	480	88.89
OUT	0	0	12	29.27	21	4.24	33	6.11
DUE	0	0	21	51.22	0	0	21	3.89
IN REVIEW	1	25	3	7.32	2	0.4	6	1.11
TOTALS:	**4**	**100**	**41**	**100**	**495**	**100**	**540**	**100**

Note: IN - local government adopted an element the Department found in compliance with State housing element law; OUT - either the local government adopted an element the Department found did not comply with State housing element law, or the local government has not yet submitted an adopted housing element pursuant to the statutory schedule; IN REVIEW - element is under review by the Department as of date of this report; DUE - means element is OUT for not submitted for current 5th planning period in which due date has passed.

According to CARB staff analysis, the percent of jurisdictions with a certified housing element varies across MPOs, as shown in the table below. Eight of the 18 MPOs have 100 percent compliance; 4 have 90+ percent; 3 have 80+ percent; 2 have 70+; MCAG has the lowest rate (i.e., 57 percent); though it should be noted that local jurisdictions (and MPOs) have different planning period schedules, which may affect the rate shown below. For a list of jurisdiction planning period schedules, please see: http://www.hcd.ca.gov/community-development/housing-element/docs/housing-element-update-schedule.pdf.

Percent of Local Jurisdictions with a Certified Housing Element by Region

MPO	In Compliance Percent
Association of Monterey Bay Area Governments (AMBAG)	71%
Butte County Association of Governments (BCAG)	100%
Fresno Council of Governments (FCOG)	94%
Kern Council of Governments (KCOG)	100%
Kings County Association of Governments (KCAG)	100%
Madera County Transportation Commission (Madera CTC)	100%
Merced County Association of Governments (MCAG)	57%
Metropolitan Transportation Commission (MTC)	100%
Sacramento Area Council of Governments (SACOG)	96%
San Diego Association of Governments (SANDAG)	95%
San Joaquin Council of Governments (SJCOG)	88%
San Luis Obispo Council of Governments (SLOCOG)	88%
Santa Barbara County Association of Governments (SBCAG)	100%
Shasta County Regional Transportation Planning Agency (SRTA)	75%
Southern California Association of Governments (SCAG)	84%
Stanislaus Council of Governments (StanCOG)	90%
Tahoe Metropolitan Planning Organization (TMPO)	100%
Tulare County Association of Governments (TCAG)	100%

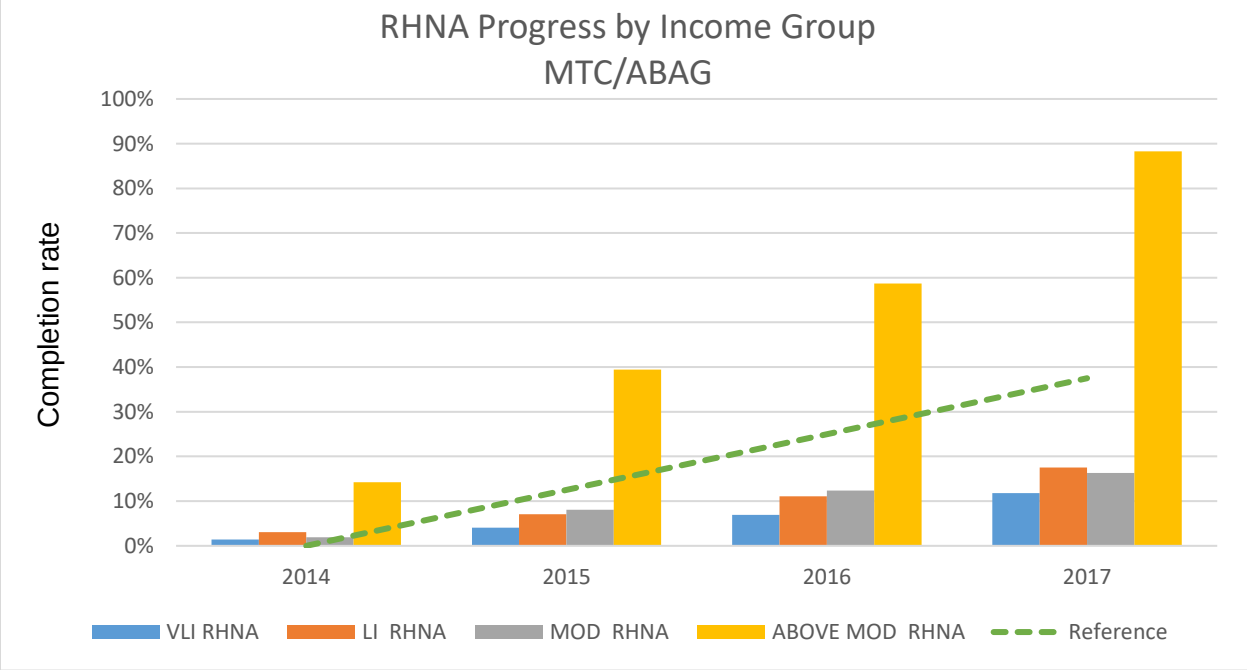
Data Source: California HCD

Housing Units Permitted Compared to Regional Housing Needs Allocation (RHNA)

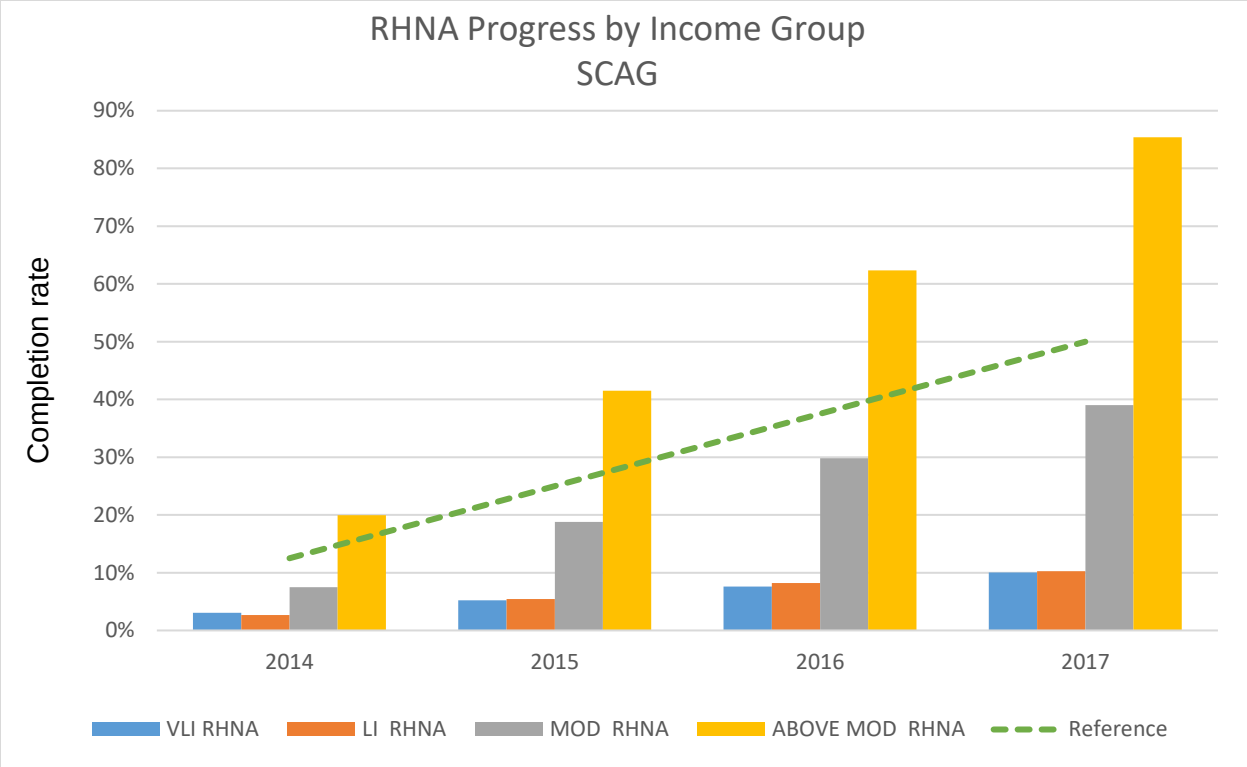
CARB staff analyzed housing development progress in each MPO compared to the region's housing need allocation as represented by their Regional Housing Needs Allocation (RHNA) status. For this analysis, CARB staff used new housing permitting information by income group from the annual progress report published by HCD on June 1, 2018, and compared it to the region's RHNA, where new housing units allocations are projected in each MPO based on income level (i.e., very low income, low income, moderate income, and above moderate income).

The following figures show the cumulative RHNA progress of each MPO based on HCD housing unit permit information, with the green dash line representing the stage of each MPO's 8-year cycle (i.e., 25 percent means in the 2nd year of the 8-yr cycle). Different MPOs may be in different stages of their timeline because MPOs start their current housing element planning period at different times. California MPOs are currently in their 5th 8-yr RHNA cycle, with SANDAG, SCAG, and SACOG having started their current cycle in 2013; BCAG, SLOCOG, SRTA and MCTC in 2014; AMBAG, MTC, FCOG, KCAG, KCAG, SBCAG, SJCOG, STANCOG, and TCAG in 2015; and MCAG in 2016. Please note that the comparison only includes jurisdictions that are included in the RHNA progress report.

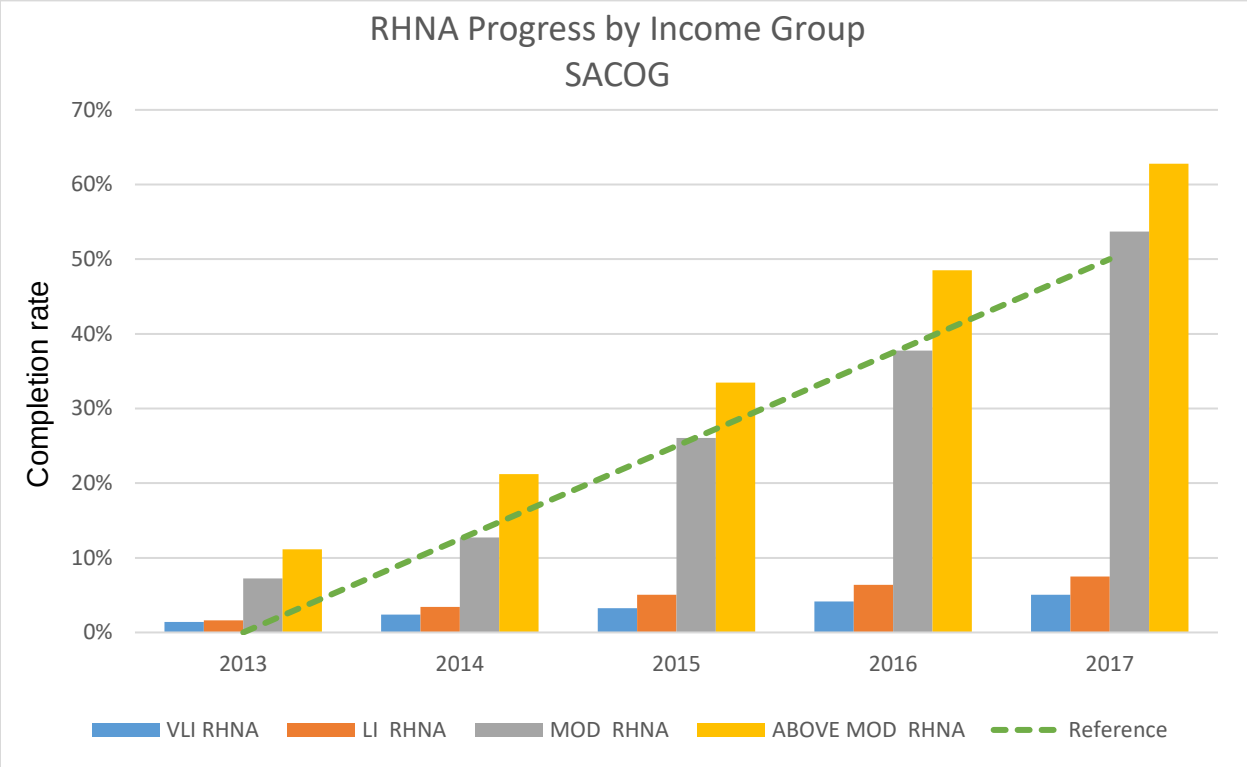
Note: When reading the charts, VLI RHNA means very low income RHNA; LI RHNA: means low income RHNA; MOD RHNA means moderate income RHNA; ABOVE MOD RHNA means above moderate income RHNA; and Reference means reference housing unit permit rate based on the stage of the RHNA cycle.



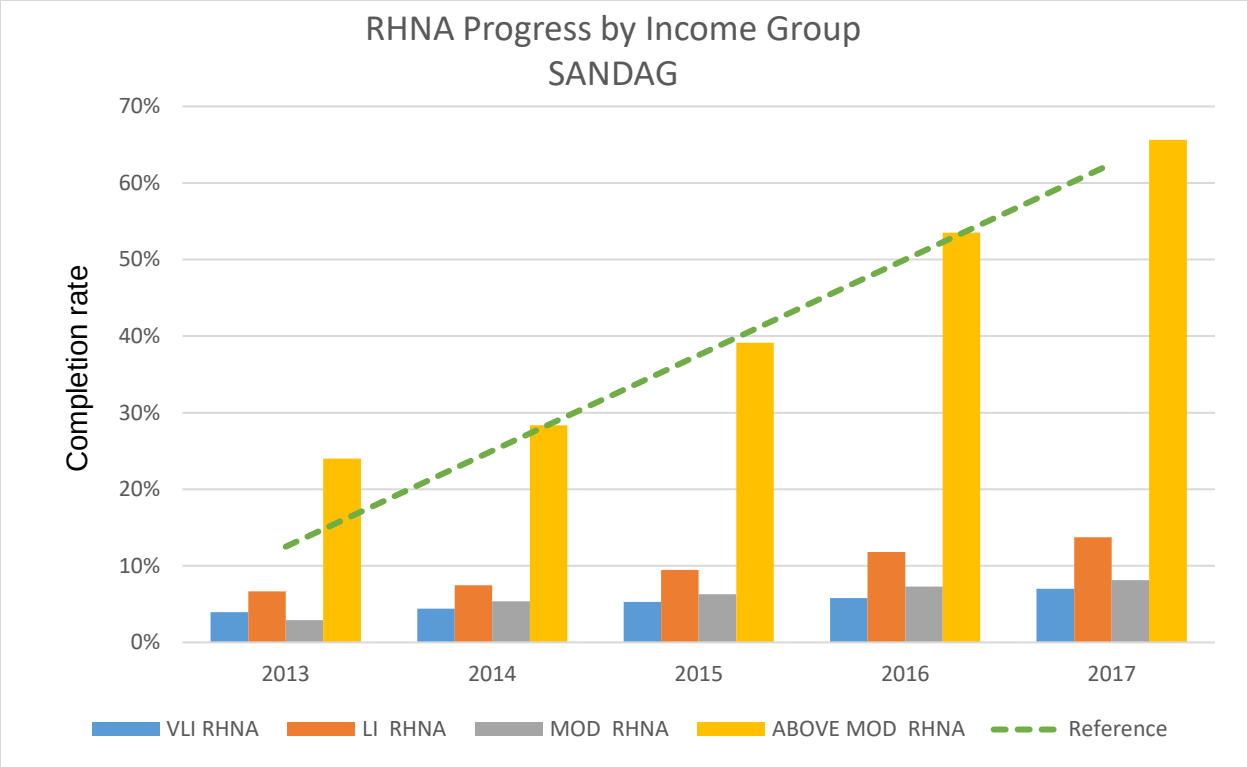
Data Source: California HCD



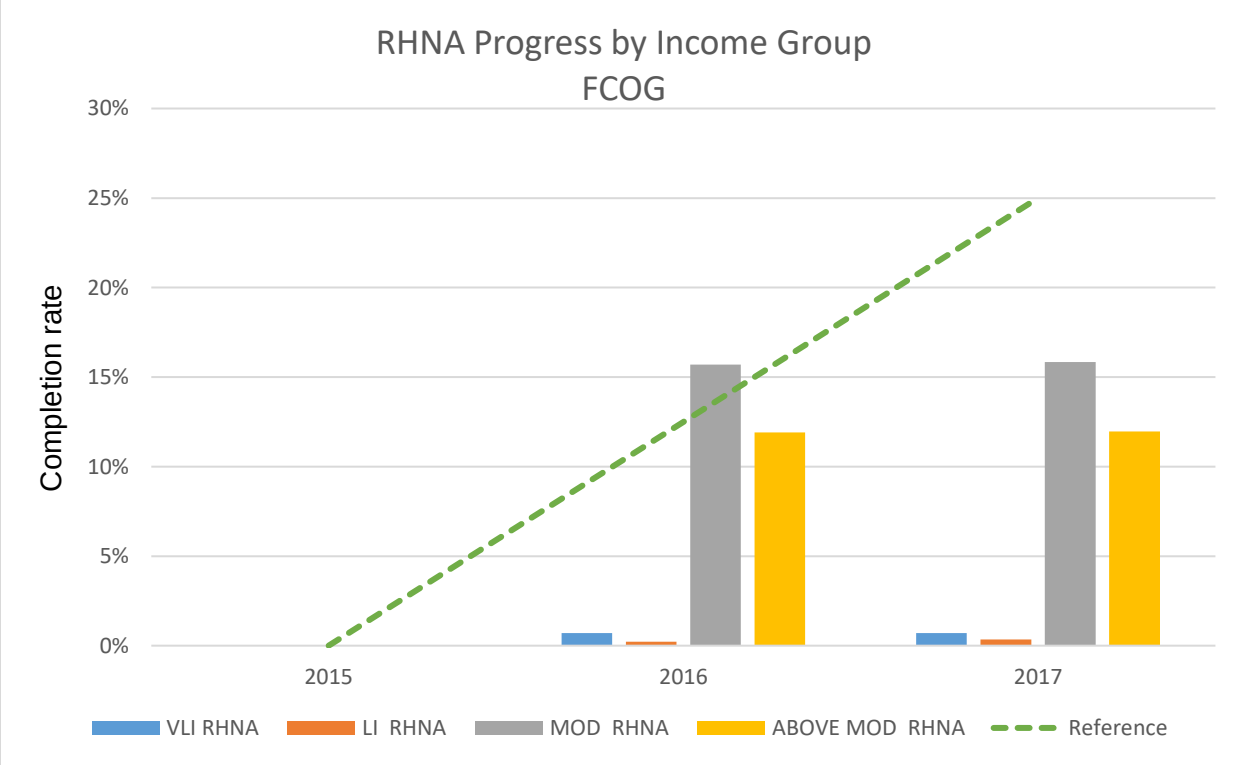
Data Source: California HCD



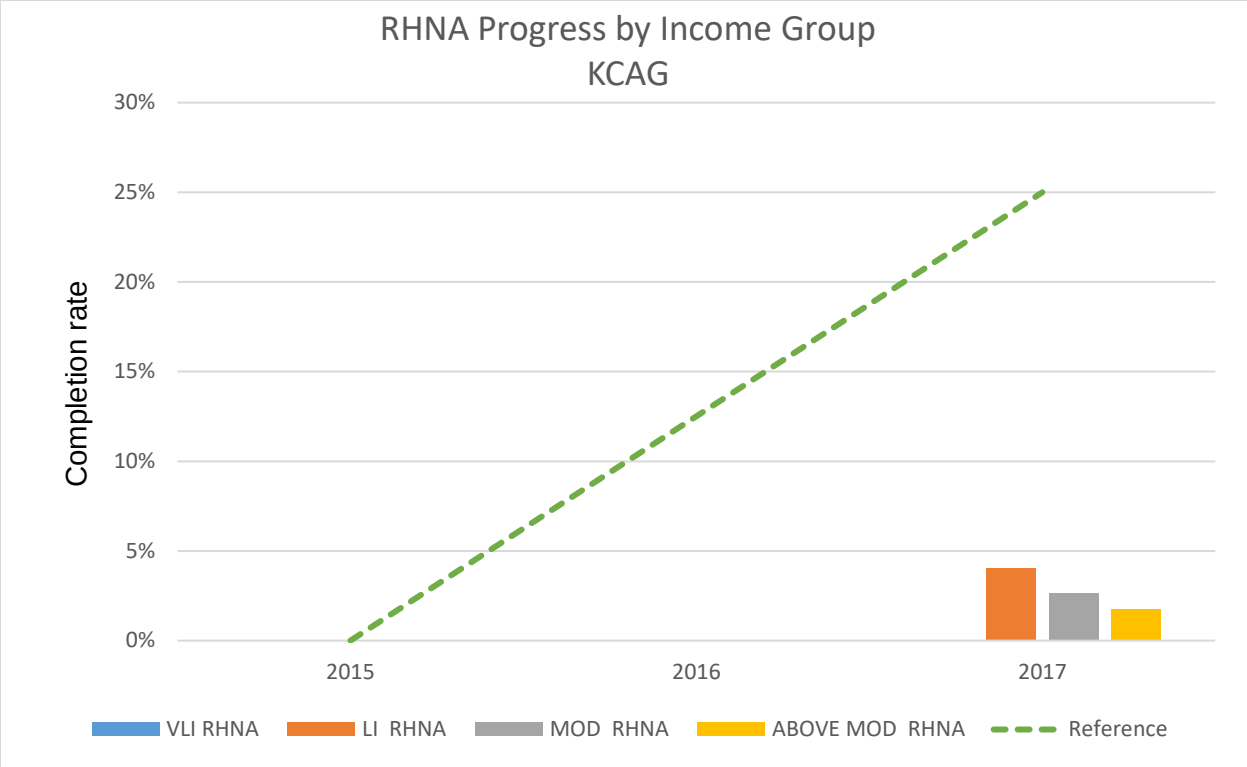
Data Source: California HCD



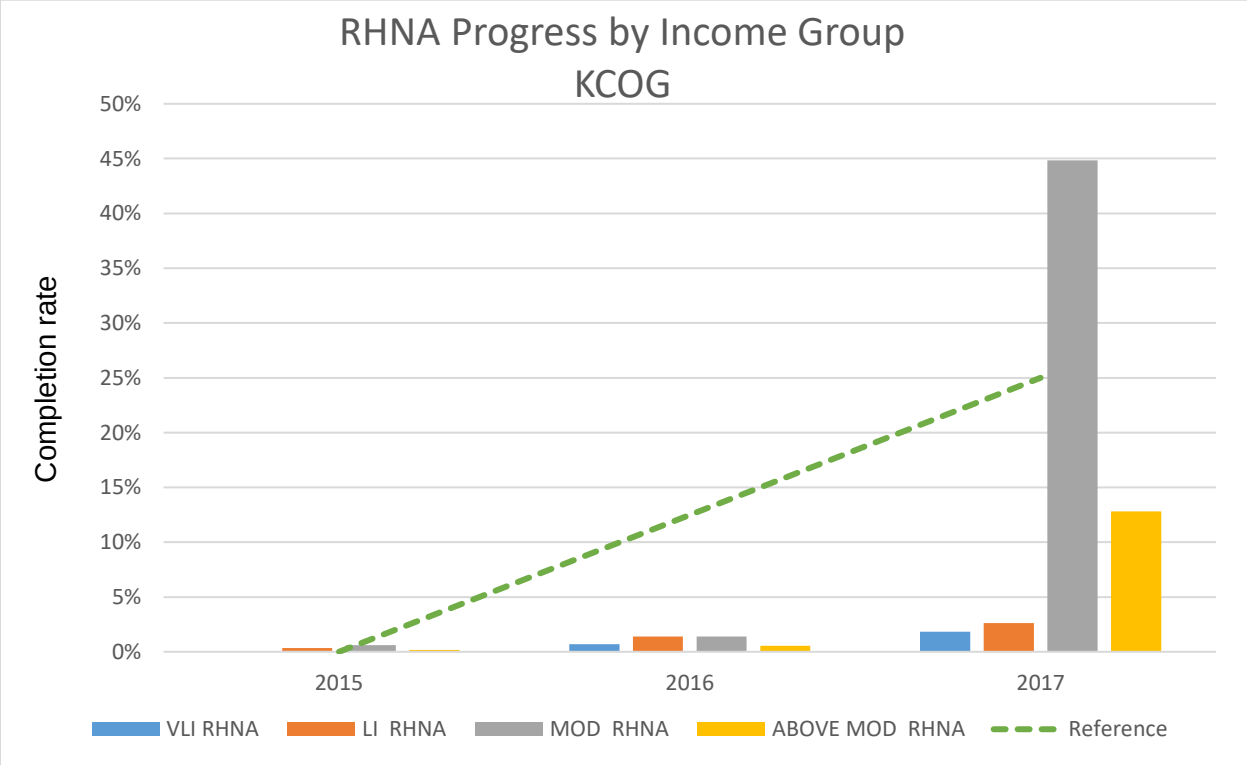
Data Source: California HCD



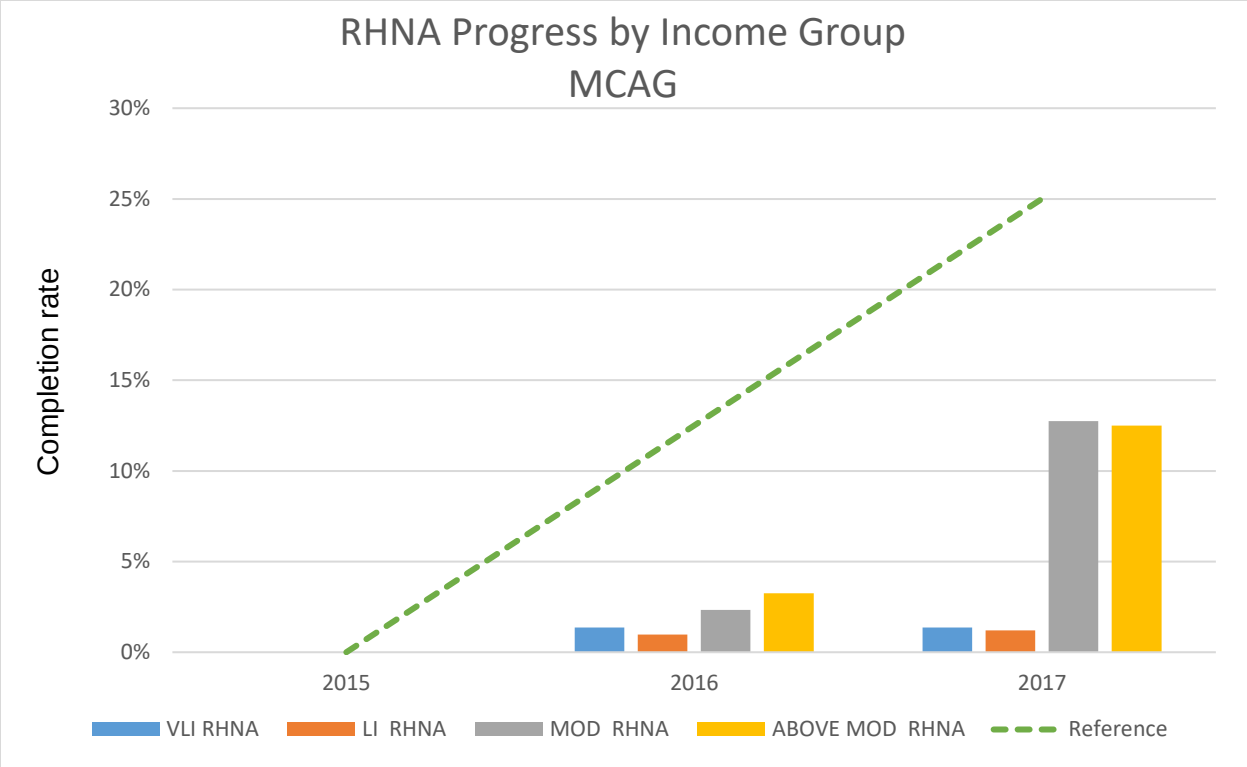
Data Source: California HCD



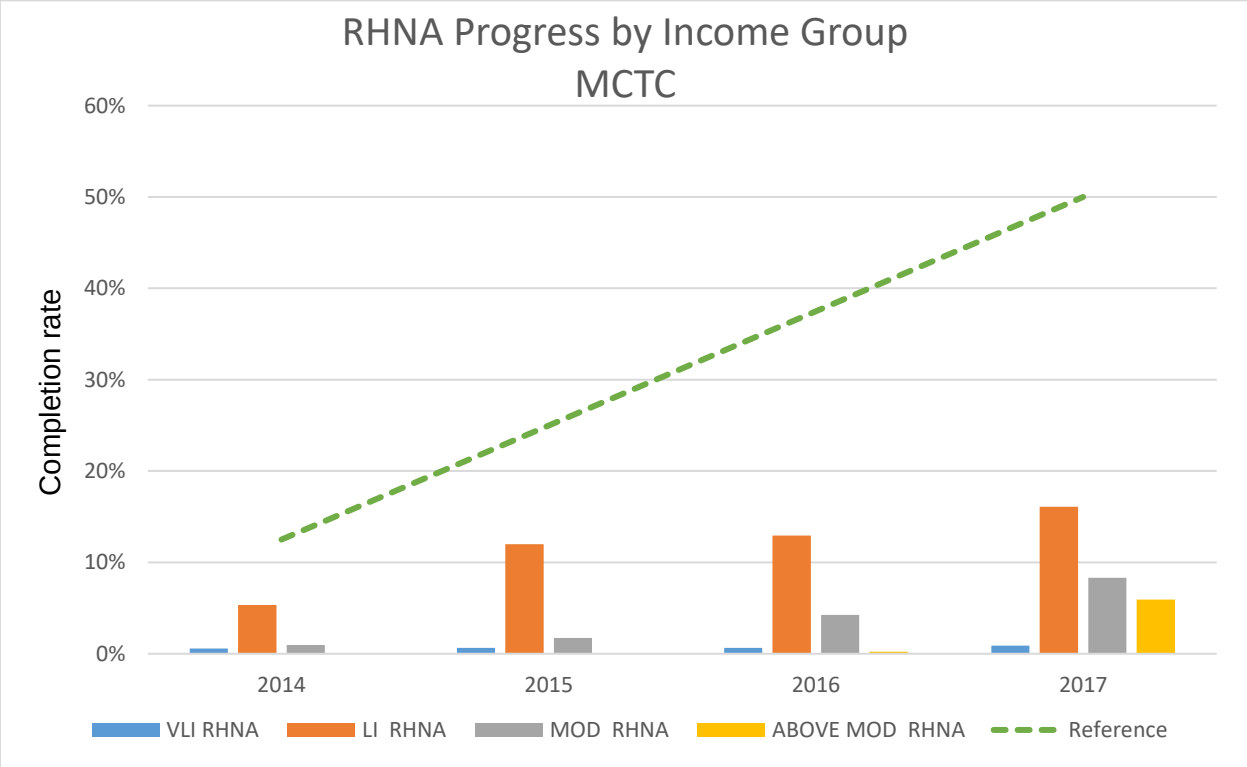
Data Source: California HCD



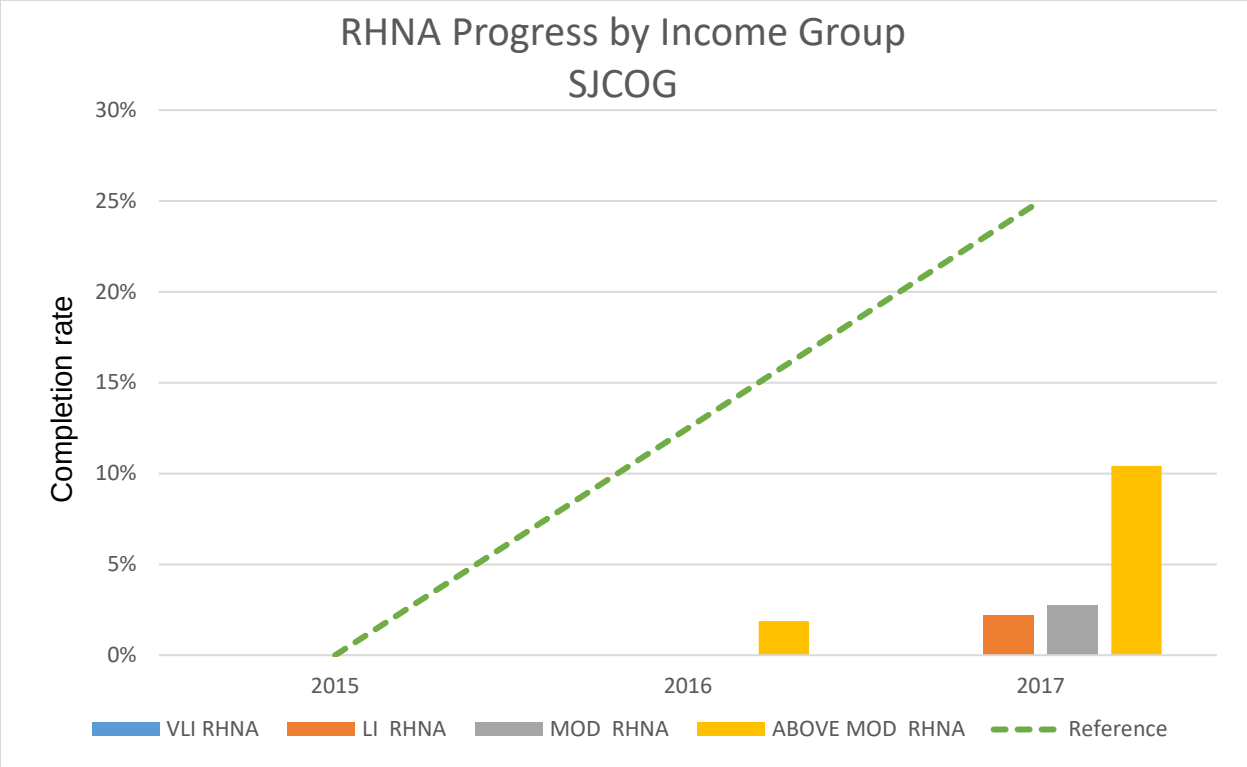
Data Source: California HCD



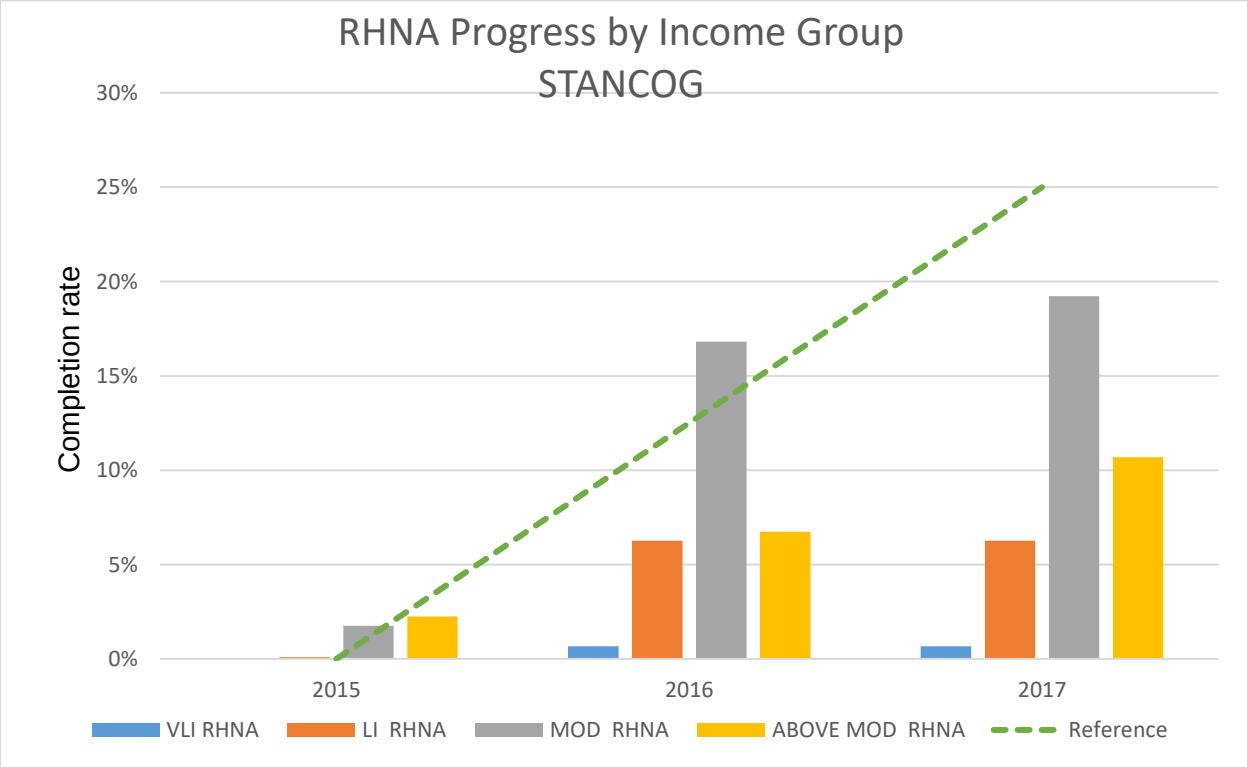
Data Source: California HCD



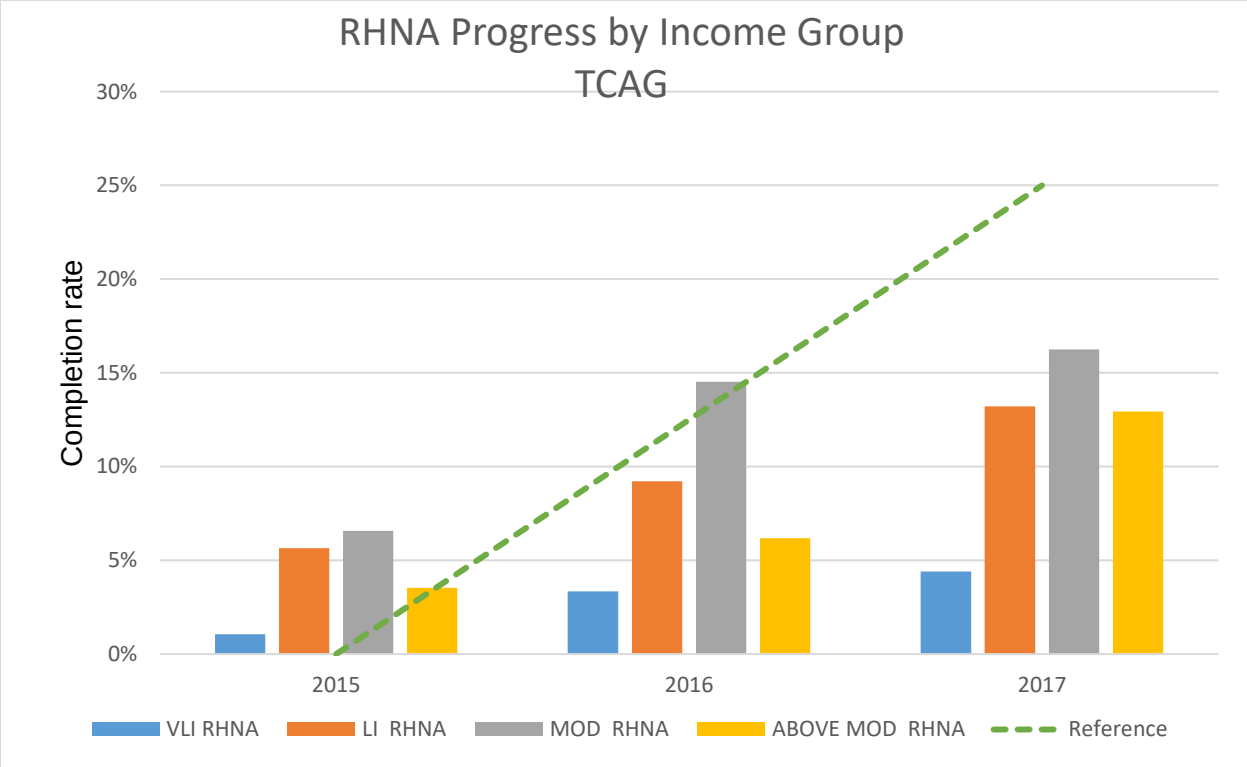
Data Source: California HCD



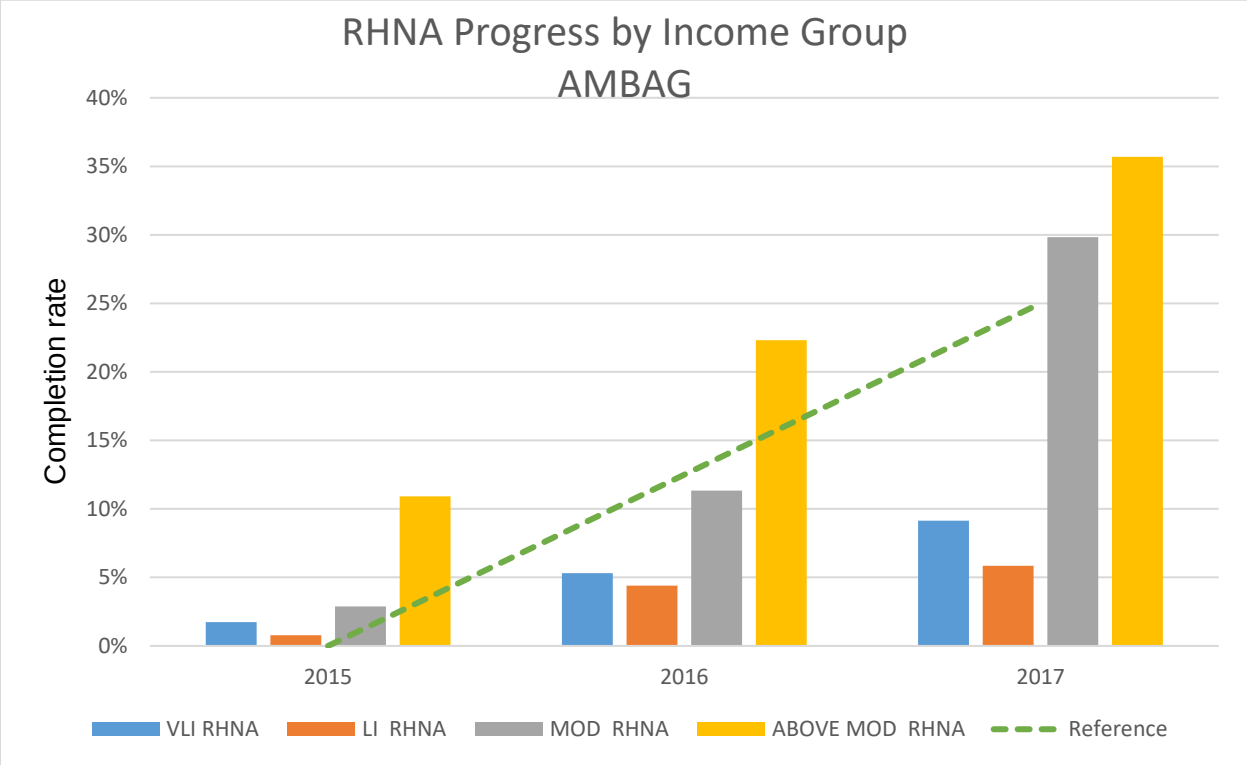
Data Source: California HCD



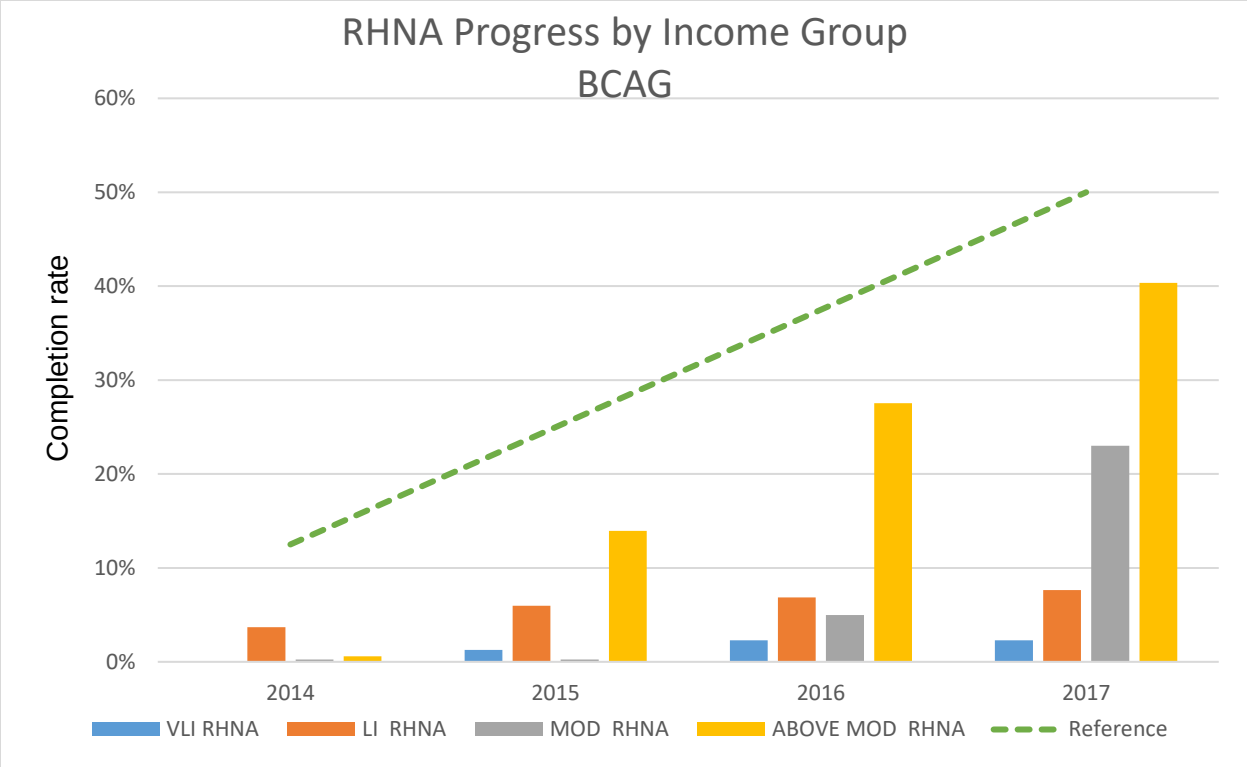
Data Source: California HCD



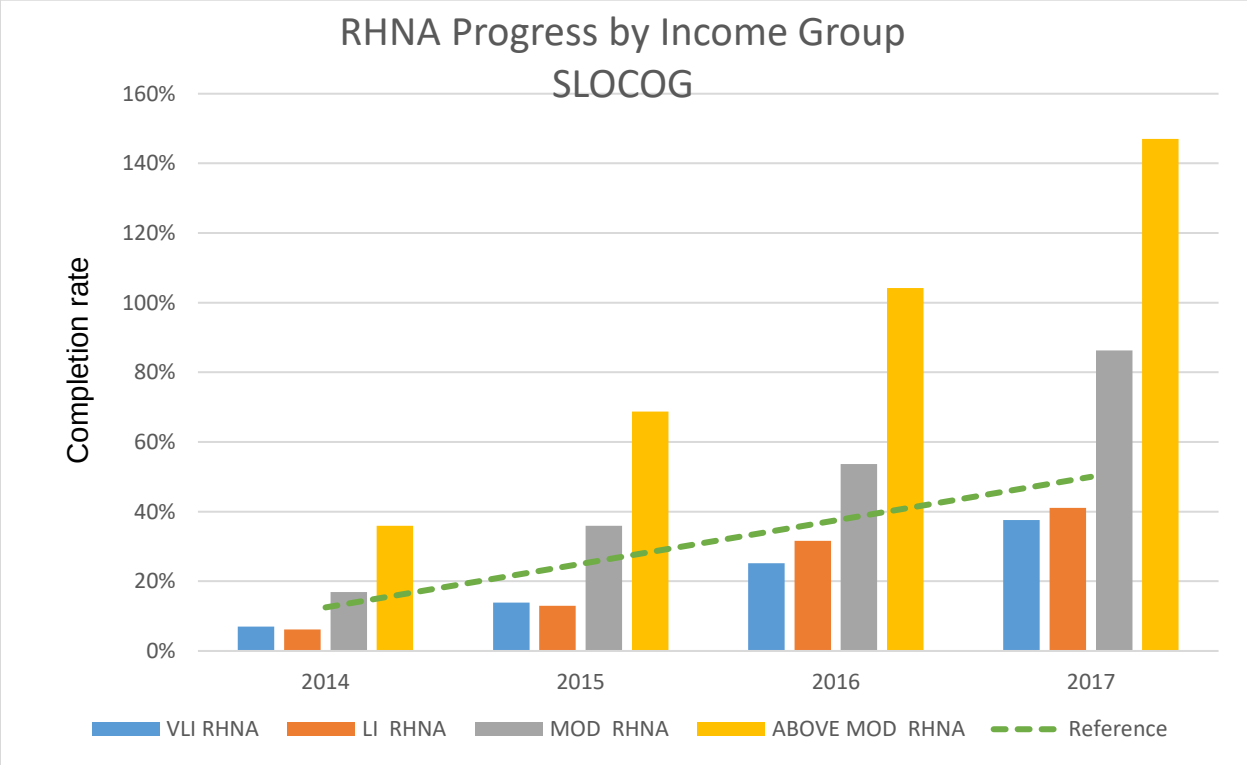
Data Source: California HCD



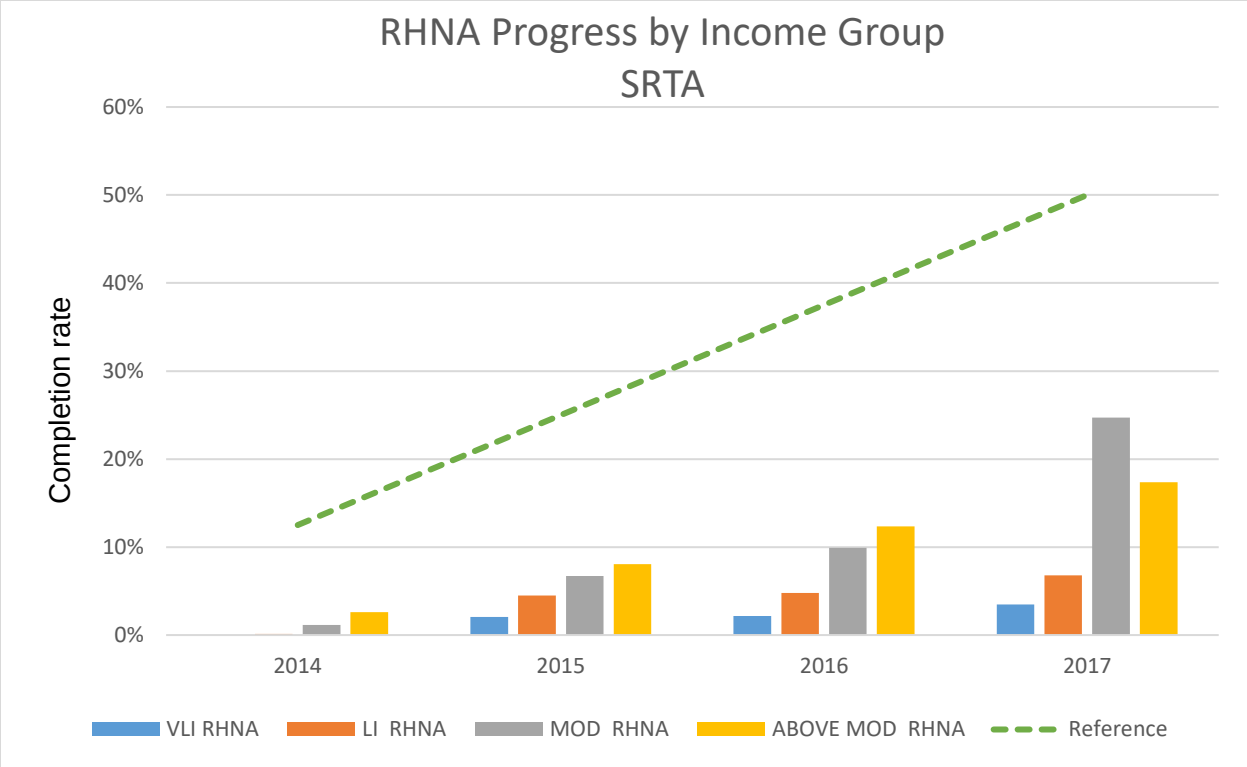
Data Source: California HCD



Data Source: California HCD



Data Source: California HCD



Data Source: California HCD

Land Use

Acres Developed

CARB staff analyzed land acres developed based on the Farmland Mapping and Monitoring Program (FMMP) data: http://www.conservation.ca.gov/dlrp/fmmp/Pages/county_info.aspx. This program tracks acreages of various types of lands that are converted from/to urban land, and reports the county level changes bi-annually. According to FMMP, Urban and Built-up Land is defined as "land occupied by structures with a building density of at least 1 unit to 1.5 acres, or approximately 6 structures to a 10-acre parcel." The definitions of all land categories are available at: http://www.conservation.ca.gov/dlrp/fmmp/Pages/mccu/map_categories.aspx.

Using this data, CARB staff calculated the bi-annual urbanized land change in every MPO from 2004 to 2014. CARB staff also analyzed land use efficiency by normalizing the urbanized land changes in every MPO region with the population change over the same time period. The land use efficiency metric calculates the urbanized land increase per 1000 population increase in every MPO region. Population information was obtained from DOF (http://www.dof.ca.gov/Forecasting/Demographics/Estimates/).

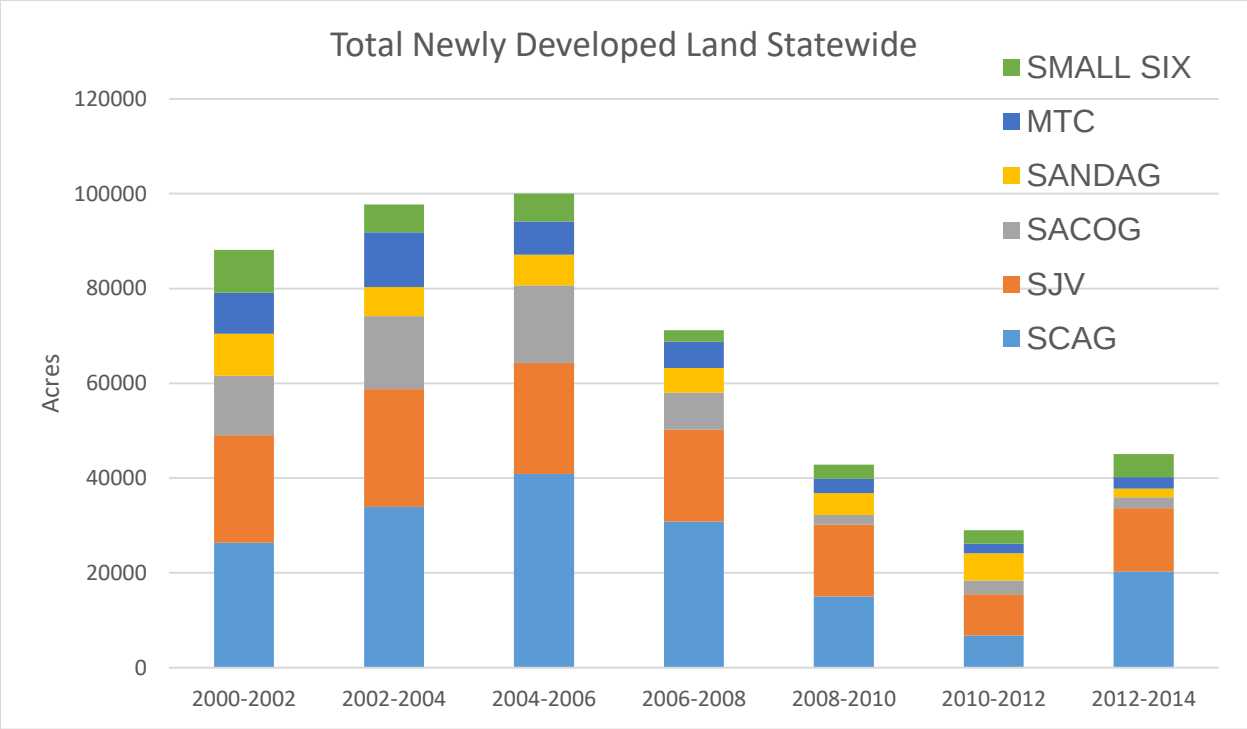
Based on this analysis, CARB staff found that acres of newly developed land in California is decreasing compared to 10-15 years ago. Of the areas that are converting

lands to development, the SCAG region is the largest contributor (i.e., 37 percent of the state's total land newly developed), which likely coincides with its share of state population (i.e., 46 percent). The SJV MPO regions contributed to the second largest share of land newly developed in California (i.e., 27 percent of the state's total land newly developed), with only 17 percent of the state population.

Total Newly Developed Land by Region

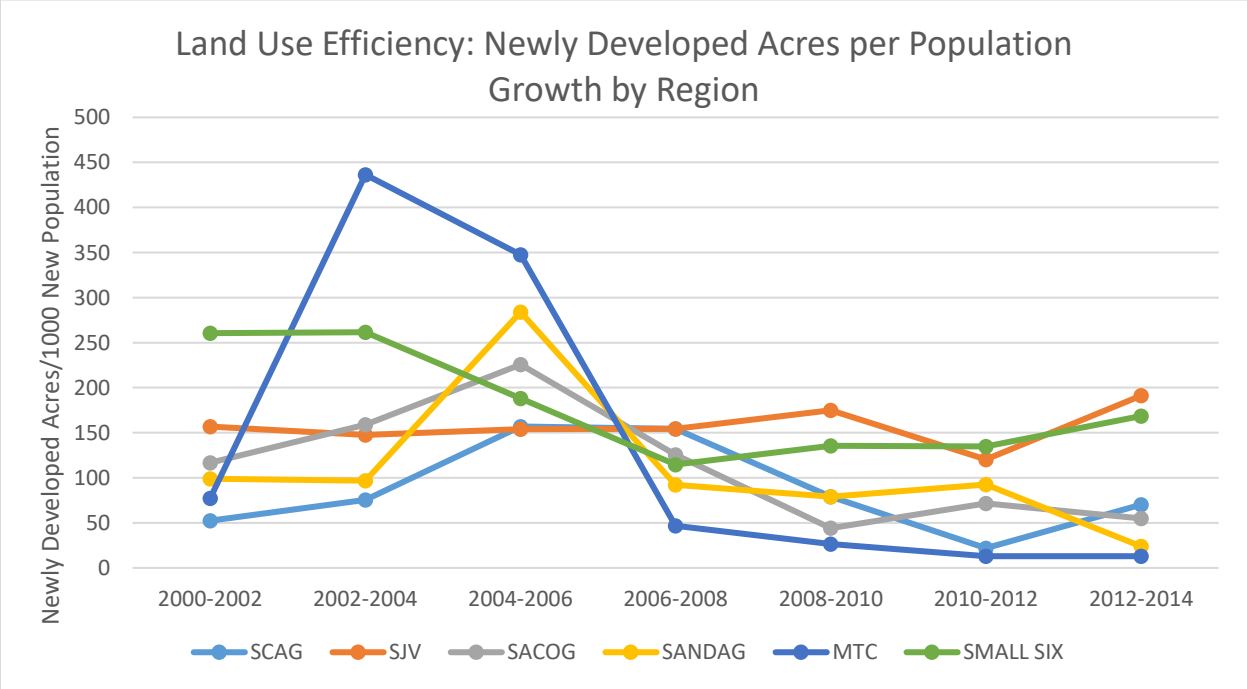
(unit: Acres)							
	2000-2002	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012	2012-2014
AMBAG	3786	790	2080	1013	1103	1391	255
BCAG	2156	1479	983	547	564	117	299
FCOG	2598	3362	4465	2296	3186	1973	1293
KCAG	857	972	681	607	3627	793	556
KCOG	6265	8610	7512	9356	3203	1829	7867
MCAG	1273	1852	1823	552	957	360	446
MCTC	1140	924	1039	996	204	1235	278
MTC	8639	11530	7046	5500	2998	1985	2413
SACOG	12614	15442	16348	7850	2035	2902	2275
SANDAG	8807	6130	6471	5184	4646	5775	1858
SJCOG	6211	3049	4426	2698	1400	1349	610
SLOCOG	2070	763	1603	656	625	556	3933
SBCAG	47	952	186	117	428	703	227
SRTA	989	1909	1001	116	290	108	126
SCAG	26375	33906	40875	30859	15056	6779	20289
STANCOG	1479	4361	1517	779	558	293	194
TCAG	2832	1715	1960	2062	1997	874	2129

Data Source: FMMP



Data Source: FMMP

CARB staff also calculated land newly developed acreage by MPO region from 2000 to 2014, divided by population change in the same time frame. Based on this analysis, regions have been trending toward using urban land more efficiently in most MPO regions since 2005.



Data Source: FMMP

Agricultural Land Lost

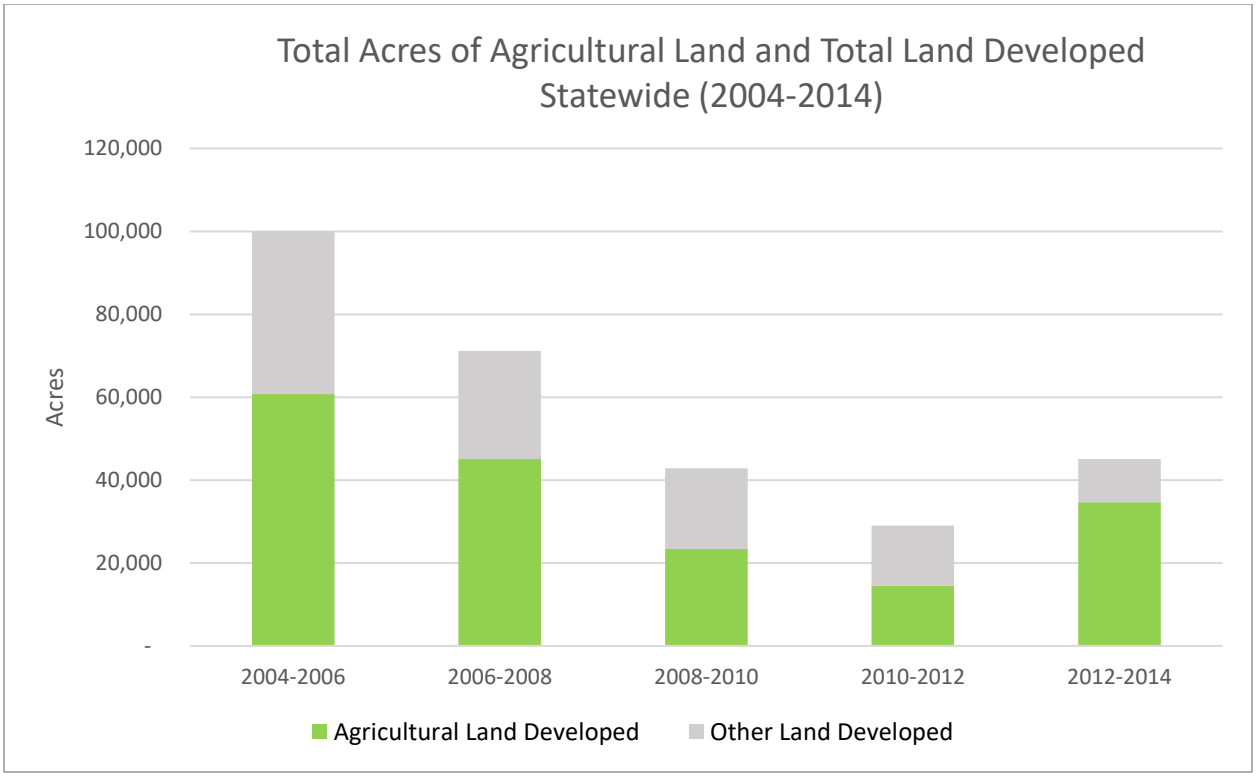
Based on the FMMP reports, CARB staff calculated the total acres of agricultural land lost in California from 2004 to 2014 statewide and by region compared to the total urbanized land acreage. For this analysis, agricultural land includes: Prime Farmland, Farmland of Statewide Importance, Unique Farmland, Farmland of Local Importance, and Grazing Land.

Total Agricultural Land Developed by Region

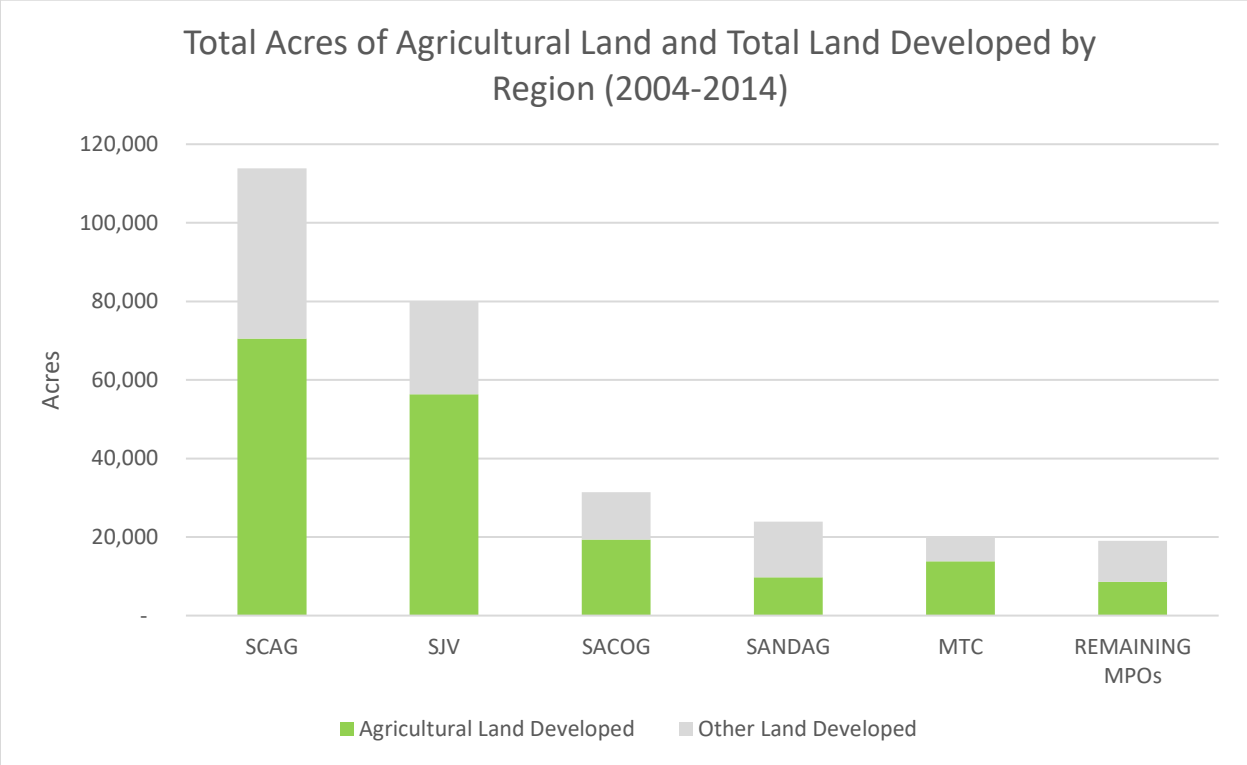
(unit: Acres)							
	2000-2002	2002-2004	2004-2006	2006-2008	2008-2010	2010-2012	2012-2014
AMBAG	933	542	580	324	309	226	202
BCAG	710	978	485	229	274	59	151
FCOG	1543	2963	3705	1678	2228	1614	1104
KCAG	526	704	409	564	1499	685	458
KCOG	1710	4820	3846	5243	2316	1103	4769
MCAG	1066	1771	1620	546	612	217	380
MCTC	618	359	869	731	128	364	27
MTC	6166	8535	4303	3426	1807	1699	2564
SACOG	7632	12163	9427	5376	1486	1420	1674
SANDAG	4889	2704	3502	2375	1677	1206	956
SJCOG	5720	2808	3749	2439	973	864	519
SLOCOG	1142	551	1200	212	413	342	3847
SBCAG	34	437	82	24	204	287	151
SRTA	250	275	105	11	33	12	11
SCAG	14948	20239	23957	19355	7113	3547	16575
STANCOG	1859	3820	1536	720	370	271	175
TCAG	2035	1508	1345	1809	1946	614	1133

Data Source: FMMP

Based on these calculations, CARB staff compared total acres of agricultural land developed with the other types of land developed statewide and by region as shown in the following figures.



Data Source: FMMP



Data Source: FMMP

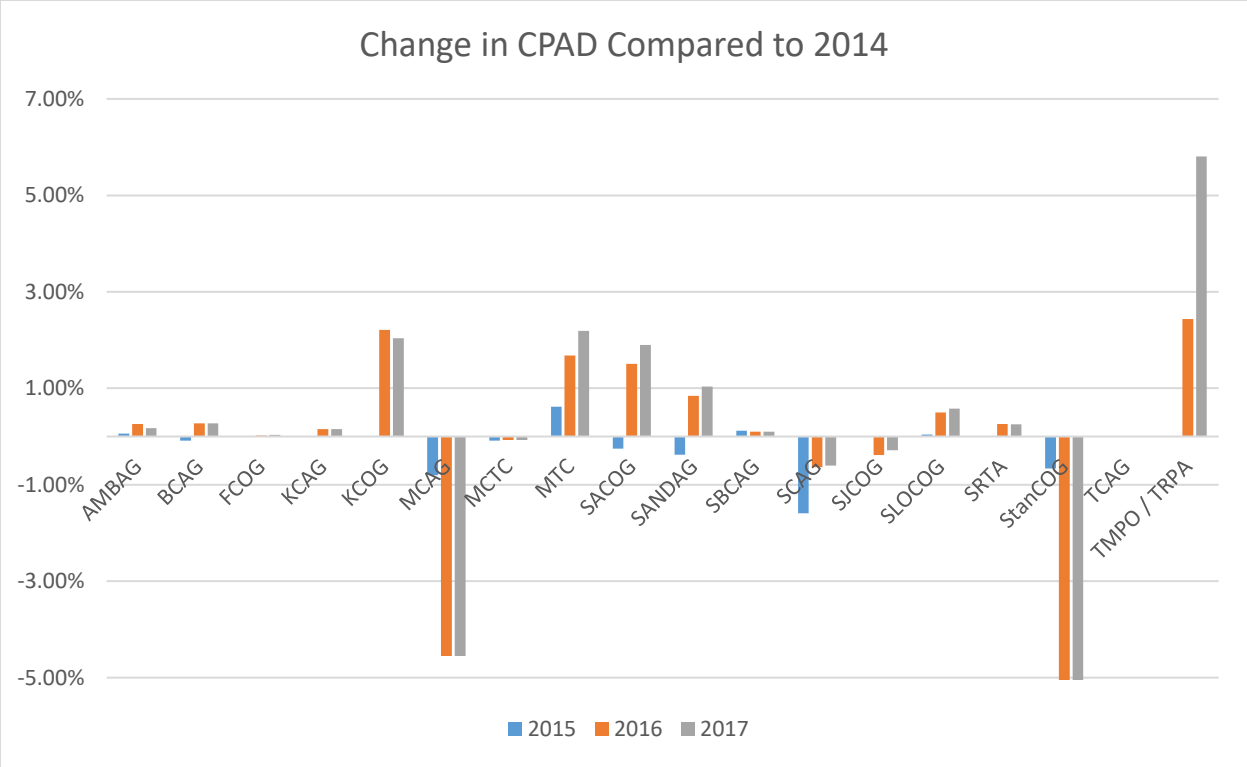
Land Conservation

CARB staff calculated the acreage of conserved land in each MPO. Historic protected open space data were collected from California Protected Areas Database (CPAD) (http://www.calands.org/). CPAD contains data about lands that are protected for open space purposes, including national/state/regional parks, forests, preserves, and wildlife areas; large and small urban parks; land trust preserves owned outright; special district open space lands, etc., that are owned by public agencies or non-profit organizations. Raw data from CPAD are published semi-annually from 2014. CARB staff analyzed the annual protected open space percent changes in every MPO based on CPAD, and the 2017 per capita protected open space area in every MPO.
Data shows that the acreage of protected land have been slowly and continuously increasing since 2014 in most MPOs, except in MCAG, SCAG, SJCOG, and StanCOG regions. The following figure shows the cumulative CPAD acreage change rate compared to 2014. The reduction of StanCOG is too big to be fully shown in the figure (i.e.,-35 percent). The per capita protected open space area in every MPO in 2017 is also provided.

Permanent Conserved Land from CA Protected Areas Database by Region

(Unit: Acres)				
MPO	**2014**	**2015**	**2016**	**2017**
AMBAG	661022	661442	662736	662182
BCAG	223357	223160	223959	223962
FCOG	1544654	1544653	1544977	1545141
KCAG	10471	10471	10487	10487
KCOG	1329458	1329408	1358820	1356581
MCAG	111417	110521	106348	106348
MCTC	515681	515230	515306	515306
MTC	1066390	1073006	1084264	1089779
SACOG	1196728	1193706	1214766	1219418
SANDAG	1340413	1335355	1351721	1354286
SBCAG	803572	804555	804360	804353
SCAG	14706342	14472274	14612614	14617418
SJCOG	18359	18360	18288	18307
SLOCOG	533240	533470	535901	536317
SRTA	1015201	1015237	1017815	1017747
StanCOG	84579	84016	55144	55144
TCAG	1557770	1557802	1557890	1557890
TMPO / TRPA	122732	N/A	125721.6	129859.6

Data Source: http://www.calands.org/



Data Source: http://www.calands.org/

* TMPO CPAD change rates were estimated by CARB staff based on shape files from CPAD.

** According to CARB staff analysis, the 35 percent reduction in StanCOG since 2016 was due to significant reduction in NGO-owned no access land in the CPAD record.

Per Capita Acreage of Protected Open Space by Region (2017)

MPO	Acres per capita (2017)
SRTA	5.70
TCAG	3.30
MCTC	3.29
TMPO / TRPA	2.95
SLOCOG	1.91
FCOG	1.55
KCOG	1.52
SBCAG	1.04
BCAG	0.99
AMBAG	0.85
SCAG	0.77
SACOG	0.49
SANDAG	0.41
MCAG	0.39
MTC	0.14
StanCOG	0.10
KCAG	0.07
SJCOG	0.02

Data Source: http://www.calands.org/

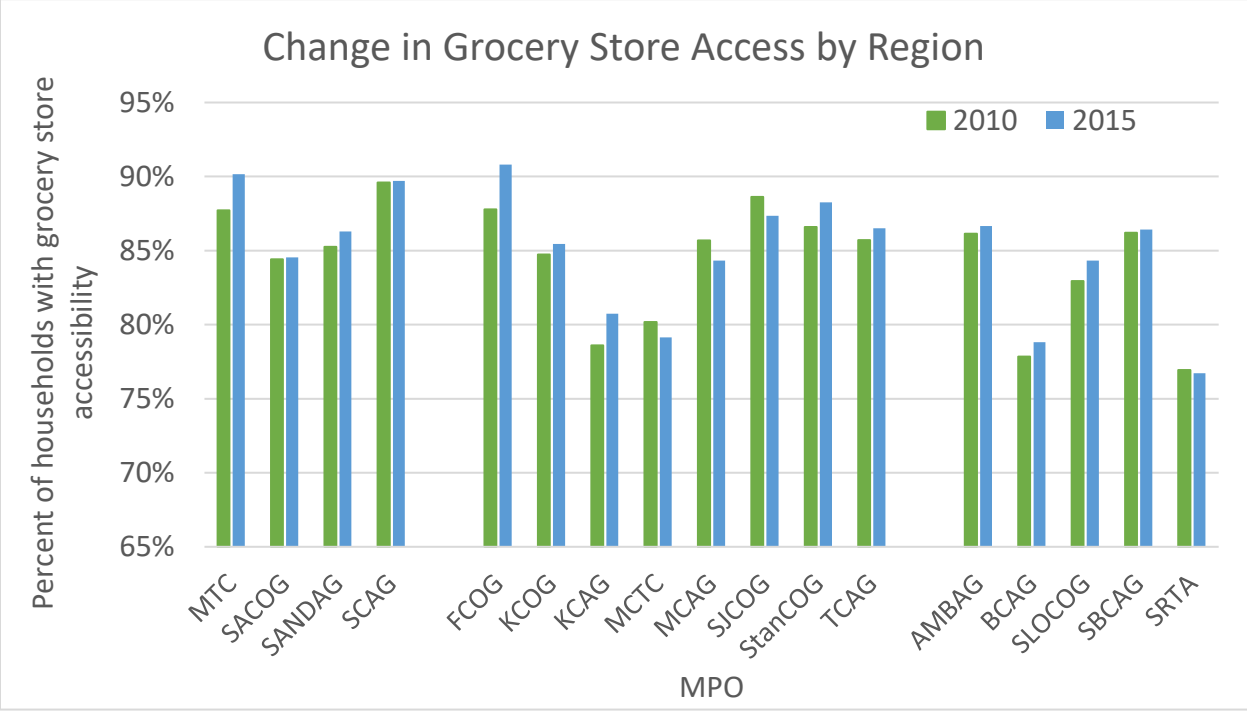
Percentage of Population Living Near a Grocery Store

CARB staff analyzed the low accessibility to store metric provided by USDA Food Environment Atlas: https://www.ers.usda.gov/foodatlas/, to calculate the percentage of households that meet the low access to grocery store criteria in both 2010 and 2015. Data from USDA provides several grocery accessibility metrics at the census tract level. CARB staff selected the "low accessibility household" metric for this reporting and calculated the low accessibility household percentage at the MPO level based on raw data. According to USDA, the "low accessibility household" is defined as households "living more than 1 mile from a supermarket, supercenter or large grocery store if in an urban area, or more than 10 miles if in a rural area". Grocery stores were identified and defined by that project as follows:

> Stores met the definition of a supermarket, supercenter, or large grocery store if they reported at least $2 million in annual sales and contained all the major food departments found in a traditional supermarket, including fresh meat and poultry, dairy, dry and packaged foods, and frozen foods.

CARB staff further converted the percentage of "low accessibility" into the percentage of "not low accessibility" shown in the figure below.

Based on this analysis, the percentage of households with accessibility to grocery stores in most MPOs has increased from 2010 to 2015. The percentage of low-accessibility households increased in three SJV MPO regions (i.e., MCTC, MCAG, and SJCOG), and SRTA from 2010 to 2015.



Data Source: USDA Food Environment Atlas