TECHNICAL EVALUATION OF THE GREENHOUSE GAS EMISSIONS REDUCTION QUANTIFICATION FOR MADERA COUNTY TRANSPORTATION COMMISSION'S SB 375 2018 SUSTAINABLE COMMUNITIES STRATEGY

October 2020

CALIFORNIA
AIR RESOURCES BOARD

This document has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the California Air Resources Board, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

Electronic copies of this document are available for download from the California Air Resources Board's Sustainable Communities Climate Program webpage.

In addition, written copies are also available. Please email California Air Resources Board program staff at sustainablecommunities@arb.ca.gov to place your request.

For individuals with sensory disabilities, this document is available in Braille, large print, audiocassette, or computer disk. Please contact CARB's Disability Coordinator at (916) 323-4916 by voice or through the California Relay Services at 711, to place your request for disability services. If you are a person with limited English and would like to request interpreter services, please contact CARB's Bilingual Manager at (916) 323-7053.

Table of Contents

List of Tables

Background

The Sustainable Communities and Climate Protection Act (SB 375) is intended to support the State's broader climate goals by encouraging integrated regional transportation and land use planning that reduces greenhouse gas (GHG) emissions from passenger vehicle use. California's metropolitan planning organizations (MPO) develop regional Sustainable Communities Strategies (SCS) – as part of their regional transportation plans (RTP) – which contain land use, housing, and transportation strategies that, when implemented, can meet the per capita passenger vehicle GHG emissions reductions targets for 2020 and 2035 set by the California Air Resources Board (CARB or Board). Once an MPO adopts an SCS, SB 375 directs CARB to accept or reject an MPO's determination that its SCS, when implemented, would meet the targets.

On September 19, 2018, the Madera County Transportation Commission (MCTC), which serves as the MPO for the Madera region, adopted its 2018 SCS, known as the *2018 Regional Transportation Plan/Sustainable Communities Strategy* (2018 SCS).[1] MCTC provided for CARB staff's review a complete submittal of the 2018 SCS and all necessary supporting information on September 23, 2020. MCTC's 2018 SCS estimates a 10 percent and a 19 percent decrease in GHG per capita emissions from light-duty passenger vehicles by 2020 and 2035, respectively, compared to 2005. The region's per capita GHG emissions reduction targets are 5 percent by 2020 and 10 percent by 2035, compared to 2005 levels, as adopted by the Board in 2010.[2] This report reflects CARB staff's technical evaluation of MCTC's 2018 SCS GHG quantification.

CARB Determination

ACCEPT

Based on a review of all available evidence, and in consideration of CARB's July 2011 document entitled *Description of Methodology for ARB Staff Review of Greenhouse Gas Reductions from Sustainable Communities Strategies Pursuant to SB 375* (2011 Evaluation Guidelines), CARB accepts MCTC's determination that the 2018 SCS plan would meet the targets of a 5 percent reduction in GHG per capita emissions from light-duty passenger vehicles by 2020 and a 10 percent reduction by 2035, compared to 2005 levels, when fully implemented.

[1] Madera County Transportation Commission. *2018 Regional Transportation Plan/Sustainable Communities Strategy*.
[2] Board Resolution 10-31 (Sept. 23, 2010).

MCTC's 2018 SCS used the same travel demand and land use strategies, quantification methods and tools as MCTC's first SCS,[3] which CARB staff reviewed and accepted as meeting the targets in February 2018. Therefore, this evaluation incorporates the analysis from CARB staff's review of the previous 2014 SCS[4] and adds analysis of updates MCTC made to the current 2018 SCS that have the potential to affect land use, transportation, and the SCS GHG emissions quantification.

As was the case with the 2014 SCS evaluation, CARB staff's review of MCTC's 2018 SCS submittal found MCTC's travel demand model continues to not be sufficiently sensitive to changes in SCS factors and that its modeled results therefore continue to not be usable for making a GHG emissions reduction determination. For purposes of this evaluation, CARB staff utilized an alternative approach that utilized the weight of evidence expressed by the SCS performance indicators, combined with expected effects on emissions in the empirical literature. This approach follows the regional performance indicators evaluation set out in the 2011 Evaluation Guidelines and is the same approach CARB staff used to evaluate MCTC's 2014 SCS.

Based on this evaluation, CARB staff accepts MCTC's determination that its 2018 SCS would meet the targets when fully implemented. CARB staff's analysis and assessment of changes to MCTC's 2018 SCS and GHG quantification are documented in the "Changes from the Region's Previous SCS" section of this evaluation.

Though CARB identified sufficient information to accept MCTC's 2018 SCS determinations, CARB staff identified issues with MCTC's 2018 SCS submittal that MCTC will need to address in its upcoming third-round SCS development and documentation process based on the *Final Sustainable Communities Strategy Program and Evaluation Guidelines*[5] published by CARB in November 2019 (2019 Evaluation Guidelines). Specifically, like the first SCS, MCTC's 2018 SCS submittal continues to lack reliable data on a number of key performance indicators and its current tools do not demonstrate the benefits of changes in land use and transportation strategies for purposes of demonstrating GHG emissions reductions from its SCS strategies. MCTC's 2018 SCS submittal also needs to be clearer about what specific actions, milestones, and enabling project investments are needed to support full implementation of its SCS policies and programs.

---

[3] Madera County Transportation Commission. *2014 Regional Transportation Plan/Sustainable Communities Strategy*.

[4] California Air Resources Board. *Technical Evaluation of the Greenhouse Gas Emissions Reduction Quantification for Madera County Transportation Commission's SB 375 Sustainable Communities Strategy. February 2018.* CARB staff's acceptance and technical evaluation of MCTC's first SCS was completed in February 2018 and contains detailed information about the methods MCTC used to quantify GHG emissions.

[5] California Air Resources Board. *Final Sustainable Communities Strategy Program and Evaluation Guidelines*. November 2019.

These issues are problematic given CARB staff's recent assessment of on-the-ground progress since regions began developing SCSs.[6] This assessment found that California was not on track to meet the GHG reductions expected under SB 375 and that continued and deeper VMT reductions are needed to achieve SB 375's goals. As a result, the Madera region may not realize the forecasted GHG reductions in the SCS for 2035, if the plan is not fully implemented. California needs strong commitments to implement vehicle miles traveled (VMT) reduction strategies to meet the SB 375 GHG commitments and support the statewide effort to successfully mitigate the worst impacts of climate change. CARB staff's concerns and suggested remedies are documented in the "Recommendations" section of this evaluation.

Changes from the Region's Previous SCS

The 2018 SCS retains all of the same strategies and tools as the previous plan with some modifications. The following sections summarize changes MCTC made from the 2014 SCS to the underlying 2018 SCS assumptions and strategies, quantification tools and methods, and resulting SCS performance indicator metrics, and CARB staff's assessment of the specified actions.

CARB staff examined MCTC's modeling inputs and assumptions, model responsiveness to variable changes, model calibration and validation results, and performance indicators using the general method described in CARB staff's 2011 Evaluation Methodology. In applying this method, CARB staff found that MCTC's 2018 SCS modeling results were not useable for purposes of making a GHG determination, as was the case in CARB's evaluation of MCTC's previous SCS. Therefore, CARB staff used an alternative weight-of-evidence approach for this evaluation. Under this approach, CARB staff compared changes in land use and transportation policy assumptions and performance indicators to estimate the expected effects on VMT and GHG emissions reductions.

Land Use and Transportation Strategies

MCTC's 2018 SCS maintains a set of land use and transportation strategies that are similar to those adopted in its previous 2014 SCS, with updates to assumptions for land use and investments. The 2018 SCS also incorporates updates to the region's growth forecast. CARB staff assessed MCTC's updates to its 2018 SCS forecast, land use, investment, and strategy inputs and found them all to be reasonable. Table 1 summarizes these changes and provides CARB staff's assessment based on consistency with best available information and practice.

[6] Prepared pursuant to Senate Bill (SB) 150 (Allen, Chapter 646, Statutes of 2017); California Air Resources Board. *2018 Progress Report: California's Sustainable Communities and Climate Protection Act.* November 2018.

Table 1. Summary of Demographic, Land Use, and Transportation Changes in MCTC's 2018 SCS Compared to the 2014 SCS

Action	CARB Staff's Assessment	Finding
Revised Regional Growth Forecast	Reasonable	MCTC revised population, housing, and employment growth estimates for its 2018 SCS. The forecasted population, households, and housing units in the year 2035 are each forecasted to decrease by approximately 17 percent, while forecasted employment is anticipated to decrease by approximately 16 percent when compared to the 2014 SCS. Per the 2011 Evaluation Guidelines, CARB staff reviewed these revisions and found them to be consistent with the 2016 DOF forecast, which was available at the time of plan development.
Updated Land Use Scenario	Reasonable	MCTC updated the SCS land use assumptions. Per the 2011 Evaluation Guidelines, CARB staff reviewed MCTC's land use update process and found that it appropriately adjusted for total growth based on the region's latest growth forecast, as well as adjusted assumptions for where growth would occur based on latest local planning assumptions in consultation with its members. The 2018 SCS land use scenario assumes enhanced densities beyond the historical growth pattern in the region from 2.6 dwelling units/acre to 3.0 dwelling units/acre countywide with even higher residential densities in the City of Madera and Southeast Strategic Growth Areas.[7]
Updated Revenue Forecasts and	Reasonable	The 2018 SCS updates both transportation revenue forecasts and investments. Per the 2011 Evaluation Guidelines, CARB staff reviewed overall changes to MCTC's SCS

[7] The Southeast Strategic Growth Areas are located to the southeast of the City of Madera near State Route 41 and North of the Fresno Metropolitan Area in the unincorporated county. Growth in these areas has been planned for through multiple Specific Plans and housing allocations.

Action	CARB Staff's Assessment	Finding
Transportation Investments[8]		planned transportation project investments and found them to be generally consistent with changes to forecasted resources. Compared to the 2014 SCS, total revenues increase from approximately $1.4 billion to $1.6 billion, or approximately 16 percent. The increase in funding is attributable to Fixing America's Surface Transportation (FAST) Act reauthorization, extension of Madera County's local sales tax measure beyond 2027 to 2042, and availability of projected county-wide impact fees. As a result, planned transportation investments are different from the previous plan with an increase in active transportation, from 3 to 6 percent. The investment in streets and roads, and transit remains the same between plans while investment in other modes like low- and zero-emission vehicle projects, electric charging stations, traffic signals, and various transportation control measures/transportation systems management projects decreases from 4 to 2 percent.

Model Calculations

MCTC used the same travel demand and land use modeling tools to quantify GHG emissions reductions from its 2018 SCS as it used for its 2014 SCS. MCTC also applied the same off-model strategies in the 2014 SCS to calculate additional GHG reductions that cannot be captured by its modeling tools. Since no changes or improvements were made to MCTC's modeling tools since the 2014 SCS, reasonableness of modeling results remains uncertain as discussed in CARB's evaluation of MCTC's 2014 SCS. Thus, CARB staff conducted the same alternative approach as it did for the 2014 SCS evaluation. Under this alternative approach, CARB staff used the weight of

[8] Updates to revenue forecasts and transportation investments were analyzed based on the data published in the 2018 RTP/SCS and 2014 RTP/SCS Amendment. The data reported in the data table was not used in this analysis.

evidence demonstrated in the performance indicators along with VMT and GHG reductions from land use and transportation strategies based on empirical literature.[9]

In addition, MCTC also carried forward all of the off-model strategies from its 2014 SCS including bicycle and pedestrian improvements, transit, commute trip reduction programs, vanpooling, and ridesharing. CARB staff's previous review and findings for these off-model calculations continue to apply, as no changes were made to the strategies or quantification of those strategies in the 2018 SCS. Overall, CARB found the resulting per capita GHG emissions reductions from MCTC's off-model strategies to be less than MCTC's claimed values. CARB staff identified errors (e.g., double counting benefits, inaccurate references to the literature), as well as a lack of information to support claimed reductions (e.g., funding support),[10] but on the whole found the reductions were still sufficient to meet the targets.

Regional Land Use and Transportation Performance Indicators

To better understand whether MCTC's key modeled land use and transportation performance indicators are trending in a direction consistent with forecasted GHG emissions and/or VMT reduction trends, CARB staff analyzed several indicators against relationships expressed in the empirical literature. Depending on what regional data were available, CARB staff compared changes in the metrics across either 2005 and the target years of 2020 and 2035, or the RTP/SCS plan base year of 2010 and target years 2020 and 2035. CARB staff assessed three performance indicators and found that all trended in a direction that was supportive and consistent with forecasted GHG emissions reductions.

Table 2 shows a summary of MCTC's 2018 SCS land use performance indicators and Table 3 shows a summary of MCTC's 2018 SCS transportation performance indicators. Data for this analysis came from MCTC's SCS data table provided in Appendix B: Data Table.

[9] Policy briefs and technical background documents, which seek to identify the impacts of key transportation and land use policies on vehicle use and GHG emissions, based on the scientific literature, can be found at https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/research-effects-transportation-and-land-use

[10] More detail on the off-model calculations reviewed by CARB staff can be found in Appendix A of CARB staff's *Technical Evaluation of the Madera County Transportation Commission Final Sustainable Communities Strategy*. February 2018.

Table 2. Summary of Land Use Performance Indicators

Performance Indicator	CARB Staff's Assessment	Finding
Residential Density	Consistent with reducing VMT/ GHG	MCTC's 2018 SCS shows an increase in residential density. MCTC forecasts that residential density will be 3.0 housing units per residential developed acre, an approximately 15 percent increase compared to its Status Quo Scenario[11] of 2.6 housing units per acre. Per the 2011 Evaluation Guidelines, CARB staff found this trend supportive and consistent with the relationship shown in the empirical literature that increasing residential density helps to increase non-auto mode shares and reduce VMT and GHG emissions.
Housing Mix	Consistent with reducing VMT/ GHG	MCTC's 2018 SCS forecasts an increase in the proportion of total housing units that are multi-family to 22.2 percent, compared to its Status Quo Scenario of 20.6 percent. In addition, MCTC's 2018 SCS categorizes five types of residential development in terms of density of units per acre (very low, low, medium, medium – high and high density). Compared to the Status Quo Scenario, the 2018 SCS shows an increasing trend in the share of medium-high-density and high-density lot size categories countywide, especially inside the City of Madera. The total share of medium-high-density and high-density lot size categories in the City of Madera increase from 16.2 to 34 percent. Per the 2011 Evaluation Guidelines, CARB staff found these trends supportive and consistent with the relationship shown in the empirical literature that increasing the proportion of new development consisting of multi-family units increases residential density and accessibility to destinations, and helps reduce VMT and GHG emissions.

[11] MCTC's Status Quo Scenario reflects growth consistent with how growth has occurred in the past. More details available at MCTC's 2018 RTP/SCS: https://www.maderactc.org/transportation/page/your-madera-2042-rtpscs

Table 3. Summary of Transportation Performance Indicators

Performance Indicator	CARB Staff's Assessment	Finding
Plan Investments by Mode	Consistent with reducing VMT/GHG	MCTC's 2018 SCS shows increased investment in public transit and other non-driving modes[12] by 14 and 26 percent, respectively compared to the 2014 SCS. Per the 2011 Evaluation Guidelines, CARB staff found this trend supportive of MCTC's strategies of improving public transit and active transportation infrastructure. Expansion of public transit and active transportation infrastructure provides more travel choices other than single-occupancy vehicles and promotes accessibility to destinations, which help reduce VMT and GHG emissions.

Recommendations

In reviewing MCTC's 2018 SCS submittal, CARB staff identified what new information MCTC will need to provide to CARB staff for its upcoming third-round SCS development and documentation process based on the 2019 Evaluation Guidelines[13] published in November 2019. The following sections provide information on what additional information will be needed in the MPO's third-round SCS evaluation submittal beyond what was shared with CARB staff in MCTC's second-round SCS. For a complete understanding of what is needed for the third-round SCS evaluation submittal, please refer to the 2019 Evaluation Guidelines.

Trend Analysis

CARB staff currently uses land use and transportation system performance indicator trends to assess whether an SCS supports GHG emissions reductions from passenger vehicles over time. This assessment will continue to be a part of CARB's third-round SCS evaluations. While MCTC's submittal included some performance indicators that were directionally supportive of certain strategies and estimated GHG reductions, data provided to evaluate the performance of key strategies in the SCS were limited.

[12] Other modes include non-motorized (bicycle and pedestrian), aviation, no and low-emission vehicle projects; electric charging stations; traffic signals; and various transportation control measures/transportation systems management projects, and etc.

[13] California Air Resources Board. *Final Sustainable Communities Strategy Program and Evaluation Guidelines*. November 2019. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Report.pdf

In the third-round SCS, MCTC will need to refine its travel demand model to demonstrate sensitivity to changes in SCS factors so that it can accurately generate performance indicators. Given that the third-round evaluations will be analyzed under the 2019 Evaluation Guidelines and will be subject to the 2018 GHG emission reduction targets, CARB staff will not be able to utilize the alternative approach used for MCTC's 2014 and 2018 SCSs to issue a determination, as it will not fully address the strategy-based evaluation components that CARB is implementing for all third-round SCSs.

MCTC will need to quantify and report changes from its next SCS plan base year to the SCS target years for the eight performance metrics identified below. CARB staff will use these for the Trend Analysis determination in the third round, which includes checking whether the reported directionality for the following RTP/SCS performance indicators are trending as expected.[14] The metrics not provided by MCTC for this evaluation are noted and italicized below.

1. Household vehicle ownership: The average number of light-duty vehicles registered (i.e., LDA, LDT1, LDT2, and MDV vehicle categories) per household.

2. Mode split: The percentage of average daily trips by travel mode, including single-occupant vehicle, high-occupancy vehicle or carpool, transit, ride hailing or TNC, bike and walk.

3. *Travel time by mode: The regional average travel time (minutes) by trip purpose (e.g., for commute and non-commute trips), by travel mode. (MCTC did not provide this metric.)*

4. *Transit ridership: The total number of transit passenger boardings on public transportation per day (one-way linked or unlinked). (MCTC did not provide this metric.)*

5. Average vehicle trip length: The regional average daily trip distance (miles/day) of driving.

6. *Seat utilization: The average daily percentage of occupied vehicle seats on the roadway network, including for passenger vehicles and transit buses. (MCTC did not provide this metric.)*

7. *Household VMT: The average daily light-duty vehicle VMT from each household within the MPO, excluding group quarters and visitors. (Although MCTC*

[14] For expected directionality of performance indicators for the Trend Analysis, see the *Final Sustainable Communities Strategy Program and Evaluation Guidelines*, Table 4, Page 39. See the following link: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Report.pdf

provided this metric, CARB staff had concerns regarding the quality of the data provided.)

8. GHG per capita: The average daily CO2 emissions within the MPO from light-duty vehicles per person.

Policy and Investment Analysis

For all third-round SCSs, CARB staff will focus on assessing whether SCS strategies for GHG emissions reduction are likely to be implemented, and are therefore reasonable for inclusion and credit toward target achievement. To assess this, MPOs need to provide clear descriptions of each SCS strategy with regard to applicable geographic scope, with specific locations if known; implementation timeframes; and what key supporting actions the MPO and its member agencies will undertake to support and track strategy implementation.[15]

Key supporting actions should correspond to each individual strategy, and in general, actions should be measurable. This can include identification of the region's specific investment commitments; policy and/or financial incentives; technical assistance; and if legislative action is needed, partnership activities to advance needed statutory changes. Each action should be clear about its scope, who will be involved, and anticipated timeline. For example, one of MCTC's key strategies is its accelerated delivery of active transportation investment in Strategic Growth Areas, with an emphasis on transformational projects and programs that expand accessibility to all ages and abilities. For the third-round SCS, MCTC will need to identify what key supporting actions it is committing to in order to help implement this strategy. MCTC will need to demonstrate how transformational projects are defined and provide more specificity with regard to location of the strategic growth area. This could include increasing funding for bike trail expansions as part of the RTP project list within the timeframe of the SCS's 2035 target year. For the third-round SCS, MCTC will need to identify whether it intends to utilize policy and/or financial incentives and/or other mechanisms to encourage growth in line with its assumptions, and show that this activity is planned to occur within the 2035 target timeframe.

CARB staff will also be evaluating how transportation investments are distributed throughout the region and whether these investments support or put at risk the GHG reduction benefits of the SCS. To assess this, MCTC needs to provide the complete list of transportation projects identified in the second- and third-round SCSs. Projects need to be tabulated by project type (road expansion, road maintenance, active transportation, transit, or other), cost, funding source (if known), project time period

[15] For more information on the Policy Analysis, see the *Final Sustainable Communities Strategy Program and Evaluation Guidelines*, Pages 40-42. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Report.pdf

(e.g., base year through 2020, 2020 through 2035, or beyond 2035), and location including jurisdiction, intersections, and roadway segments (if available).

Tracking Implementation and Plan Adjustment

In the third-round SCS evaluation, CARB staff will look at how an MPO's previous SCS strategies and actions are performing, in compliance with SB 150, and what MPOs are doing in the third-round SCS, if the previous plans are not performing as expected, as directed by the Board.[16, 17] CARB's *2018 Progress Report: California's Sustainable Communities and Climate Protection Act*, prepared pursuant to SB 150, provides some information in this area based on the latest observed statewide data and trends. For the next SCS, MPOs need to compare available observed data to the development pattern and travel assumptions used in its previous SCSs to achieve its targets. If the observed data do not align with the plan assumptions, an MPO should document what priority adjustments and changes it is making in the third-round SCS to get the region on track to achieve its SB 375 targets.

MCTC needs to clearly document how they are using data to track implementation progress of its SCS, as well as justify any adjustments it makes to the underlying baseline assumptions. In particular, CARB staff encourages MCTC to gather more detailed transit and active transportation data to help better assess the effectiveness of the land use and transit service strategies in the SCS.

Model Improvements and Strategy Quantification Methods

CARB staff noticed that there are no improvements in MCTC's travel demand modeling framework (i.e., MIP 1) for the 2018 SCS, compared to what was used for its previous 2014 SCS. MCTC also kept the same model base years of 2010 as the last SCS and used the same exogenous variables such as auto operating cost. CARB staff recommend that MCTC improve its modeling for future SCSs. For example, MCTC should improve the travel demand model's sensitivity to various land use and transportation strategies in its plan, and provide model validation and calibration results. MCTC should also update its model base year and exogenous variables based on best available data such as the National Household Travel Survey (NHTS), Census Transportation Planning Package (CTPP), traffic counts, and the American Community Survey (ACS), to better reflect the most recent conditions and improve the reliability of

[16] *Final Sustainable Communities Strategy Program and Evaluation Guidelines*, Page 37-38 and 43-44. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Report.pdf

[17] Gov. Code § 65080 (b)(2)(J)(iv); CARB Resolution 18-12 (Mar. 22, 2018), available at https://ww3.arb.ca.gov/board/res/2018/res18-12.pdf?_ga=2.82570705.658998873.1595222033-1647288959.1528825053

modeling results. More detailed recommendations to the modeling process can be found in the Recommendation Section of CARB's evaluation to MCTC's 2014 SCS[18].

MCTC applied a number of off-model methods to quantify VMT and GHG emission reductions from strategies that could not be captured by its model as discussed above. In addition to these quantified off-model strategies, MCTC also listed two new strategies: accelerated adoption of plug-in electric vehicles and interregional transit including High Speed Rail but not analyzed the VMT and GHG impacts of these strategies. If MCTC plans to include these off-model strategies in future SCSs for credit toward its targets, it needs to provide sufficient information to substantiate the associated GHG emissions reductions. For the third-round SCS evaluation, the following additional documentation is needed for each off-model strategy that is quantified before GHG emissions reduction credit can be received:[19]

- A comprehensive description of all off-model strategies, including the scope of the strategies, the target users, the timeline of implementation, and current status of the strategies;
- Detailed quantification methods and assumptions for each strategy that document the step-by-step analysis of the strategy benefits;
- Identification of funding commitments or local policies that support implementation of each strategy; and
- The efforts to collect local data and monitor implementation.

Analyze Induced Travel (Short-Term and Long-Term) Effects

Induced travel is the increase in VMT due to roadway capacity expansion. Roadway expansion projects can lead to increases in travel due to changes in the number of trips and trip distances (destination changes); shifts in travel modes, the time-of-day travel occurs, and routes; as well as changes in residence and workplace locations. Induced travel is important to analyze as it can affect VMT and GHG emissions.

CARB staff recommends MCTC explore methods for better analyzing the short- and long-term induced travel from roadway expansion projects in future SCS cycles. MCTC included roadway expansion projects in the 2018 SCS that can lead to short- and long-term induced travel in the region. Currently, long-term induced travel is not well accounted for by MCTC's travel demand model and may underestimate per

[18] Available at: https://ww2.arb.ca.gov/sites/default/files/2020-06/Technical_Evaluation_of_the_GHG_Emissions_Reduction_Quantification_for_the_MCTC_SB_375_SCS_February_2018.pdf

[19] For more information on quantifying GHG emissions off model, see the *Final Sustainable Communities Strategy Program and Evaluation Guidelines*, Appendix E. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Appendices.pdf

capita GHG emissions. CARB staff has identified available tools to help MCTC evaluate the effects of induced travel.[20] Examples include, but are not limited to, University of California, Davis National Center for Sustainable Transportation's Induced Travel Calculator[21] and Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions.[22]

[20] For more information on the Transportation Policy Analysis where induced travel is discussed, see the *Final Sustainable Communities Strategy Program and Evaluation Guidelines*, Pages 40-41. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-11/Final%20SCS%20Program%20and%20Evaluation%20Guidelines%20Report.pdf

[21] Available at: https://ncst.ucdavis.edu/research/tools/

[22] Available at: https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf

Appendix A: MCTC's Strategy Table

This is a summary table based on MCTC's submittal that compares the key land use and transportation strategies between the 2014 and 2018 SCSs. This table also illustrates how the individual strategies are accounted for using travel demand model or off-model analyses.

SCS Strategy[23]	ON/OFF Model	Carryover from Last SCS or New?	Comments
Population and employment shift to Strategic Growth Areas (SGA)	Travel Demand Model	Carryover from 2014 SCS, as amended, plus updates	The 2018 SCS preferred scenario (Moderate Scenario) further shifts new employment and households towards urban cores and zones identified for infill development. The preferred scenario is shaped by the Madera County Blueprint planning efforts and parallels local planning activities such as the City of Madera's Downtown 2018 Development Incentive Program.
Increased residential densities in SGAs	Travel Demand Model	Carryover from 2014 SCS, as amended, plus updates	The preferred scenario increases densities of new employment and housing in urban areas, while also increasing new development densities in the City of Chowchilla and SGAs in Madera County. (2018 RTP Table 6-3: 2018 RTP/SCS UPLAN Land Use Allocation Model Parameters)
Increased automobile operating costs[24]	Travel Demand Model	Carryover from 2014 SCS, as amended	Automobile operating costs remain unchanged.
Increased public transportation service	Off-Model	Carryover from 2014 SCS, as amended	The travel demand model for the 2018 SCS does not have a transit network and is thus not sensitive to

[23] Population and employment shift to Strategic Growth Areas, increased residential densities in SGAs were modeled using the travel demand model (MIP I) and were counted toward MCTC's GHG emissions reduction targets. GHG emissions reductions for the increased public transportation service, increased vanpooling, accelerated delivery of active transportation investment in Strategic Growth Areas, with an emphasis on transformational projects and programs that expand accessibility to all ages and abilities, were counted and quantified using an off-model methodology. Accelerated adoption of plug-in electric vehicles in response to expanded vehicle charging network and interregional transit including High Speed Rail were not submitted for evaluation to CARB staff and were not counted toward the SB 375 targets.

[24] CARB does not consider auto operating cost an SCS strategy in its evaluation, rather it is an exogenous variable that affects the region's travel activity.

SCS Strategy[23]	ON/OFF Model	Carryover from Last SCS or New?	Comments
			transit strategies. MCTC has built a new fixed-route transit network into the traffic model for future RTP/SCS modelling. The off-model analysis includes transit ridership projections from 2017.
Commute Trip Reduction (TDM)	Off-Model	Carryover from 2014 SCS, as amended	The City of Madera has a commute trip reduction strategy within the city that will reduce 5.2 percent of the commute trips.
Increased Vanpooling	Off-Model	Carryover from 2014 SCS, as amended	The off-model analysis includes vanpool ridership projections from 2017.
Ridesharing	Off-Model	Carryover from 2014 SCS, as amended	The off-model analysis of ridesharing in the region forecasts growth that is coordinated with Valleyrides, a program sponsored by the Fresno Council of Governments.
Accelerated delivery of active transportation investment in Strategic Growth Areas, with an emphasis on transformational projects and programs that expand accessibility to all ages and abilities	Off-Model	Carryover from 2014 SCS, as amended	In 2018, MCTC prepared the Madera County Active Transportation Plan (ATP). The ATP identified 293 miles of potential active transportation projects for the entire region, estimated costs, developed an implementation strategy, developed a maintenance plan for new and existing facilities, developed a complete streets policy, identified available funding and prioritized identified projects for delivery.
Accelerated adoption of plug-in electric vehicles in response to expanded vehicle charging network	Not Quantified	New	MCTC has funded an increasing number of projects utilizing electric charging outlets. Recent cycles of the Congestion Mitigation and Air Quality Program have funded electric charging stalls in parking structures in Downtown Madera and electric vehicles and infrastructure for the City of Madera's public transit system. Additionally, the City of Madera was awarded an $11.3 million Affordable Housing and Sustainable Communities Grant for the Veterans and Family Housing Project, which will provide charging

SCS Strategy[23]	ON/OFF Model	Carryover from Last SCS or New?	Comments
			infrastructure, as well as walking and biking facilities and transit services in Downtown Madera.
Interregional transit including High Speed Rail	Not Quantified	New	Over $123 million has been identified for commuter rail access improvements in Madera County. This project would be completed in two phases. The first phase will utilize Transit and Intercity Rail Capital Program (TIRCP) funds. An application for TIRCP funding for the second phase is in development. The investments are meant to provide better access to current Amtrak service and future High-Speed Rail train service by relocating the train station to a corridor with fixed-route transit service investment. Additional benefits to this location include: proximity to a larger ridership capture basin in the region, proximity to the Madera College, which is classified as a Regional Transit Hub with high transit oriented development growth potential in the Madera College Specific Plan. The Station Relocation Project is currently in the environmental phase.

Appendix B: Data Table

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
DEMOGRAPHICS									
Total population (used for per Capita Calculations)	140,313	150,865	164,834	183,176	201,590	242,530	214,269	265,161	With - DOF 2016 Projections Without - DOF 2012 Interim Projections
Group quarters population	N/A	8,930	10,161	10,161	12,333	12,333	13,156	13,156	Planning Center 2012
Total employment (employees)	41,295	43,547	47,186	57,740	59,832	71,557	63,377	76,914	Model Input
Average unemployment rate (%)	7.90	16.60	N/A	N/A	N/A	N/A	N/A	N/A	DOF
Total number of households	39,244	43,304	48,351	54,470	58,931	71,200	63,822	76,746	Model Input
Persons per household	3.58	3.48	3.49	3.36	3.37	3.41	3.38	3.46	Pop/HH
Auto ownership per household	2.13	2.15	2.24	2.13	2.11	2.12	2.11	2.12	Annual Vehicle Population Emfac14/HH

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Median household income	N/A	48,268	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LAND USE									
Total acres within MPO	1,374,080	1,374,080	1,374,080	1,374,080	1,374,080	1,374,080	1,374,080	1,374,080	EIR
Total resource area acres (CA GC Section 65080.01)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total farmland acres (CA GC Section 65080.01)	N/A	759,446	N/A	N/A	N/A	N/A	759,001	N/A	EIR
Total developed acres	N/A	59,973	60,271	N/A	62,508	N/A	63,552	N/A	Land Use Model Output
Total commercial developed acres	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total residential developed acres	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Total housing units	39,244	43,303	48,735	54,469	59,295	71,202	64,223	76,746	Model Input
Housing vacancy rate	0.12	0.12	0.09	0.11	0.09	0.10	0.09	0.09	Model Input
Total single-family detached housing units	32,108	35,876	39,921	44,178	47,629	56,766	51,226	63,952	Model Input
Total small-lot single-family detached housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total conventional-lot single-family detached units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total large-lot single-family detached units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total single-family	899	922	1,250	1,030	1,535	1,183	1,668	1,700	Model Input

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
attached housing units									
Total multi-family housing units	4,678	4,945	6,004	7,741	8,573	11,719	9,770	9,621	N/A
Total mobile home units & other	1,559	1,560	1,560	1,520	1,559	1,534	1,559	1,473	N/A
Total infill housing units	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total mixed-use buildings	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total housing units within ¼-mile of transit stations and stops	4,311	4,608	4,784	5,295	5,302	6,243	N/A	N/A	Model Input
Total housing units within ½ mile of transit stations and stops	13,352	14,104	15,224	16,847	17,413	20,500	N/A	N/A	N/A
Total employment within ¼mile of transit	12,530	13,381	14,125	15,631	15,714	18,500	N/A	N/A	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
stations and stops									
Total employment within ½ mile of transit stations and stops	18,098	19,550	21,232	23,496	24,141	28,421	N/A	N/A	N/A
TRANSPORTATION SYSTEM									
Freeway general purpose lanes – mixed flow lane miles	125	133	136	133	185	205	207	212	Model Network
Highway (lane miles)	179	179	189	179	187	175	180	175	
Expressway (lane miles)	62	62	64	62	91	79	104	92	
HOV (lane miles)	N/A	N/A	N/A	N/	N/A	N/A	N/A	N/A	
Arterial (lane miles)	783	787	826	787	945	952	945	952	N/A
Collector (lane miles)	324	324	342	324	432	430	433	432	N/A
Local (lane miles)	87	87	80	87	59	59	60	60	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Freeway-Freeway (lane miles)	2	2	3	2	3	2	3	2	N/A
Local, express bus, and neighborhood shuttle operation miles	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bus rapid transit bus operation miles	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Passenger rail operation miles	26.5	26.5	26.5	26.5	26.5	26.5	26.5	26.5	Amtrak
Transit total daily vehicle service hours	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bicycle and pedestrian trail/lane miles	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vanpool (total riders per weekday)	N/A	N/A	492	492	4,005	4,005	8,005	8,005	Calvans
TRIP DATA									

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Number of trips by trip purpose	N/A	(2018)	N/A	N/A	N/A	N/A	N/A	N/A	Model Output
Home-based work	96,628	104,931	114,396	117,428	136,460	157,650	148,371	173,794	N/A
Home-based shop	53,900	58,509	64,471	68,310	78,373	92,649	86,359	102,944	N/A
Home-based other	145,824	158,857	167,051	172,905	201,256	235,187	221,545	260,248	N/A
Home-based school	45,092	49,311	54,248	59,738	63,651	74,457	68,038	81,638	N/A
Home-based university	9,918	11,074	12,482	13,997	15,416	18,337	16,801	20,450	N/A
Non-home-based work	29,232	31,332	39,157	39,376	48,395	55,569	55,195	62,383	N/A
Non-home-based other	178,922	193,313	201,340	247,665	254,837	319,663	281,366	363,045	N/A
Average weekday trip length by trip purpose (miles)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Model Output
Home-based work	10.98	9.25	9.62	9.74	9.17	9.65	9.21	11.19	N/A
Home-based shop	8.57	6.58	5.98	7.14	5.48	6.71	5.65	7.52	N/A
Home-based other	7.59	6.21	6.02	6.23	5.48	6.01	5.66	7.21	N/A
Home-based school	3.99	2.73	2.76	3.98	2.91	3.73	2.99	4.11	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Home-based university	11.71	13.48	13.14	10.66	12.55	10.08	12.66	12.55	N/A
Non-home-based work	10.31	11.54	11.57	9.22	10.37	9.21	11.13	11.51	N/A
Non-home-based other	7.73	3.02	3.01	5.38	2.45	4.06	2.37	3.92	N/A
MODE SHARE									
Vehicle Mode Share (Peak Period)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SOV (% of trips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HOV (% of trips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Transit (% of trips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Non-motorized (% of trips)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Vehicle Mode Share (Whole Day)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Model Output
SOV (% of trips)	0.4065	0.3951	0.4022	0.4026	0.4015	0.4002	0.4000	0.4014	Model Output
HOV (% of trips)	0.5724	0.5831	0.5744	0.5687	0.5727	0.5706	0.5740	0.5829	Model Output
Transit (% of trips)	0.0028	0.0028	0.0035	0.0034	0.0037	0.0028	0.0040	0.0016	Model Output

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Non-motorized (% of trips)	0.0183	0.0190	0.0199	0.0253	0.0221	0.0264	0.0220	0.0140	Model Output
Average weekday trip length (miles)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Model Output
SOV	9.79	10.10	9.47	9.27	8.44	7.88	8.49	9.01	Model Output
HOV	6.82	7.00	6.54	6.41	5.50	5.67	5.54	5.79	Model Output
Transit	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Walk	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bike	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRAVEL MEASURES [3]									
Total VMT per weekday for passenger vehicles (ARB vehicle classes of LDA, LDT1, LDT2 and MDV) (miles)	2,626,348	N/A	2,768,097	3,043,148	3,250,218	3,723,361	N/A	N/A	EMFAC 14
Total II (Internal) VMT per weekday	1,459,571	N/A	1,741,222	1,914,238	2,233,367	2,558,484	N/A	N/A	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
for passenger vehicles (miles)									
Total IX/XI VMT per weekday for passenger vehicles (miles)	1,098,531	N/A	961,934	1,057,516	948,924	1,087,061	N/A	N/A	N/A
Total XX VMT per weekday for passenger vehicles (miles)	68,245	N/A	64,941	71,394	67,927	77,816	N/A	N/A	N/A
Congested Peak Hour VMT on freeways (Lane Miles, V/C ratios >0.75)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Congested Peak VMT on all other roadways (Lane Miles,	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
V/C ratios >0.75)									
CO2 EMISSIONS									
Total CO2 emissions per weekday for passenger vehicles (ARB vehicle classes LDA, LDT1, LDT2, and MDV) (tons)	1,193	N/A	1,229	1,364	1,412	1,579	N/A	N/A	EMFAC output
Total II (Internal) CO2 emissions per weekday for passenger vehicles (tons)	663	N/A	773	858	970	1,085	N/A	N/A	N/A
Total IX / XI trip CO2 emissions per weekday for passenger	499	N/A	427	474	412	461	N/A	N/A	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
vehicles (tons)									
Total XX trip CO2 emissions per weekday for passenger vehicles (tons)	31	N/A	29	32	30	33	N/A	N/A	N/A
EMFAC Adjustment									
% change in per capita GHG due to EMFAC 2011 to EMFAC2014 adjustment (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No adjustment
INVESTMENT [4]									
Total RTP Expenditure ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	1,831.388	1,393.684	N/A
Highway capacity expansion ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	1077.326	742.711	N/A
Other road capacity	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
expansion ($mm)									
Roadway maintenance ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	258.816	292.952	N/A
BRT projects ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Transit capacity expansion ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	47.989	40.447	N/A
Transit operations ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	188.155	197.985	N/A
Bike and pedestrian projects ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	54.457	36.205	N/A
Other Investments ($mm)	N/A	N/A	N/A	N/A	N/A	N/A	204.645	83.385	N/A
TRANSPORTATION USER COSTS									
Vehicle operating costs ($ per mile)	11.37	18	17.78	17.78	18.85	18.85	19.2	19.2	Model Input
Gasoline price ($ per gallon)	2.24	3.65	4.46	4.46	6.06	6.06	N/A	N/A	Model Input

Modeling Parameters	2005	2010	2020 With Project [1]	2020 Without Project [2]	2035 With Project	2035 Without Project	2042 With Project	2040 Without Project	Data Source(s)
Average transit fare ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parking cost ($)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] "With Project" represents the scenario chosen for the 2018 RTP/SCS.

[2] This scenario is MCTC's Business as Usual scenario, which is what would happen under its 2014 RTP for the respective calendar year.

[3] Passenger vehicles includes (1) passenger cars (LDA), (2) light-duty trucks whose gross vehicle weight rating (GVWR) <6000 lbs and equivalent test weight (ETW) <= 3750 lbs (LDT1), (3) light-duty trucks whose GVWR <6000 lbs and ETW > 3751 lbs (LDT2), and (4) medium-duty vehicles whose GVWR is between 6000 and 8500 lbs (MDV). In the CARB vehicle category, these four categories of vehicles are referred to as LDA, LDT1, LDT2, and MDV, respectively.

[4] Updates to revenue forecasts and transportation investments were analyzed based on the data published in the 2018 RTP/SCS and 2014 RTP/SCS Amendment. The data reported in the data table were not used in this analysis.