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Task 5 Report: GHG Emissions Reductions from Carbon Reduction Program Projects

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16. Abstract
The Carbon Reduction Program (CRP) requires transportation projects to demonstrate measurable reductions in transportation-related greenhouse gas (GHG) emissions, but the impact of priced managed lanes and related roadway pricing projects on emissions can vary. Thus, there is a need for a transparent framework that can place evidence within a common statewide emissions metric. This report develops a screening framework to translate project-level GHG impact data from CRP-relevant projects in California into a wider statewide framework for emissions accounting. The preliminary framework separates the direct effects of a priced managed lane project on roadway travel demand from its indirect effects. In a case study analysis, the I-580 managed project lane is predicted to directly increase VMT and CO_2 emissions through induced travel demand. However, reinvestment of the lane's revenue in regional transit is projected to reduce VMT and CO_2e emissions. In conclusion, a CRP GHG accounting should evaluate direct roadway effects and reinvestment effects separately before integrating them within a common statewide emissions accounting framework.

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Disclaimer

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Executive Summary

Executive Summary

The Carbon Reduction Program (CRP) requires transportation projects to demonstrate measurable reductions in transportation-related greenhouse gas (GHG) emissions. However, the impact of priced managed lanes and related roadway pricing projects on emissions can vary by both the method of analysis utilized and the regional context. Thus, there is a need for a transparent framework that can place project-level evidence within a common statewide emissions metric. This report develops a preliminary screening framework that illustrates a first step toward translating project-level GHG impact data from CRP-relevant project types in California into a larger standardized emissions accounting framework. The framework combines a statewide EMFAC2025 emissions baseline with project-level evidence from the literature, applying a common daily unit for vehicle miles traveled (VMT) and carbon dioxide equivalent (CO_2e). It separates two pathways that are often combined in program discussion: the direct roadway effect of a priced managed-lane project on travel demand, and the indirect effect of investing revenue—potentially from a priced lane—in lower-carbon transportation, such as transit. To demonstrate this approach, we used two example scenario-based case studies in California. The first is a modeling study of an I-580 eastbound managed-lane that provides corridor-level data on the direct VMT effect of a priced managed-lane implementation in California. The second is from the Bay Area Transit 2050+, which projected estimates of regional passenger-VMT resulting from major transit investment. The results show that the direct I-580 managed-lane effect would increase VMT and emissions when considered alone, but regional transit reinvestment of revenue—potentially generated from the I-580 managed lane—would substantially reduce VMT and CO_2e emissions. The report thus concludes that evaluating CRP GHG direct roadway effects and reinvestment effects separately before integrating them provides for a more robust common statewide emissions accounting framework. Future work incorporating additional California case studies and more advanced statistical methods for synthesizing heterogeneous project outcomes may enable more robust statewide assessment as Caltrans identifies specific projects, delivery years, and revenue-funded investments.

Contents

Introduction

The Carbon Reduction Program (CRP) requires that funded projects demonstrate measurable reduction of greenhouse gas (GHG) emissions. However, estimating the emissions impacts of transportation projects, particularly priced managed lanes (PMLs), is difficult and varies with method of analysis and the project's context.

Roadway pricing strategies can influence travel behavior in multiple ways. While PMLs may improve traffic flow and reduce congestion, they can also increase effective roadway capacity and potentially induce additional travel, increasing vehicle miles traveled (VMT). Thus, studies of PML implementation across different regions have reported heterogeneous effects on travel demand and VMT [1]. Simultaneously, revenues generated from pricing strategies are often reinvested in lower-carbon transportation options, such as transit and active transportation, which may in turn reduce VMT and emissions at a broader system level.

These competing mechanisms and heterogeneous outcomes create uncertainty in determining the net GHG impact of CRP-funded projects and complicate extrapolation from individual projects to statewide emissions outcomes. As a result, there is a need for a transparent and consistent analytical framework that:

- uses a common baseline for emissions estimation; and
- enables comparison across different project types.

This report addresses this need by combining a statewide emissions baseline with case-study evidence to demonstrate a preliminary framework for translating CRP project-level GHG impacts into a common emissions accounting framework. The analysis separates between two pathways: the direct effect of priced managed lane projects on vehicle travel, and the effect of lower-carbon transportation investments such as major transit improvements that can be funded alongside pricing programs [1, 2, 3]. This is done to understand how separation of GHG-related mechanisms may better inform model robustness.

All results are reported in per-day units. The statewide baseline is derived from EMFAC2025 daily statewide outputs [4]. Following the literature review, two California case studies are used to demonstrate the framework. The first is the I-580 eastbound managed-lane case study, selected because it provides corridor-level empirical evidence on the direct VMT effect of a priced managed lane in California [1]. The second is the Bay Area Transit 2050+ comparison, selected because it provides a published regional estimate of passenger-VMT reduction from a major transit investment [3]. Together, the two cases represent different mechanisms and scales: a direct roadway pricing effect and a system level lower-carbon investment effect. This common accounting approach allows corridor evidence, regional transit evidence, and statewide baseline values to be compared within a single framework.

Literature Review

Literature Review Method

A focused literature review was conducted to identify case studies with estimates of vehicle miles traveled (VMT) and GHG impacts associated with CRP-relevant project types. The purpose of the review was to characterize the range of reported outcomes and to inform the selection of case-study values applied in this analysis, rather than to compile all study results. The review covered major categories of projects eligible under CRP, including PMLs and other roadway pricing strategies, transit investments, active transportation, and vehicle electrification.

The review drew primarily on publicly available sources, including reports from California agencies such as the California Air Resources Board (CARB), Caltrans, and the Metropolitan Transportation Commission (MTC), as well as selected academic studies and policy analyses. Emphasis was placed on studies that are directly applicable to California or to comparable US transportation systems.

Studies were selected based on their ability to provide quantitative estimates of VMT or GHG impacts, as well as their use of empirical data or established modeling approaches. Preference was given to sources that report results in a form translatable into daily VMT or emissions changes, consistent with the units used in this report.

Findings from the reviewed studies were synthesized to identify magnitude of impacts within project-level data. The full literature review included 71 documents and is summarized in the technical appendix here. The documents cover California, US, and other state or multi-state examples, including 28 California-focused documents and 21 national US documents. Most documents reported quantitative, mixed, or qualitative evidence on VMT, GHG, traffic, mode shift, speed, congestion, safety, equity, accessibility, or other outcomes.

Major Findings and Supporting Evidence

The literature indicates that different categories of CRP projects influence vehicle travel and greenhouse gas (GHG) emissions through distinct mechanisms. For example, the VMT and GHG impacts of PML projects are heterogeneous and depend on roadway design, pricing strategies, and regional travel behavior. Empirical evidence from the I-580 managed lane case study in Northern California shows an increase in corridor-level VMT after implementation [1], consistent with findings from the California Air Resources Board (CARB), which note that managed lanes may induce additional travel under certain conditions [2], particularly when the conditions increase effective roadway capacity. Conversely, data from the I-680 managed lane case study shows a decrease in VMT post-implementation [1], highlighting context dependence of PML impacts. Additional evidence from Southern California further illustrates this regional heterogeneity. In the I-405 HOV-to-HOT conversion and associated corridor improvement case, a before-after comparison showed lower corridor VMT and emissions in 2024 than in 2017; however, after accounting for broader Orange County highway VMT decline, the corridor appeared to attract more traffic than would be expected under regional trends, partly offsetting operational and fleet-related emissions benefits [5]. As a result, direct GHG impacts from managed-lane projects can vary substantially by project context and by the counterfactual assumptions used.

In contrast, broader pricing strategies applied at the network level have generally been associated with reductions in VMT and emissions due to their influence on overall travel demand. Transit investments demonstrate strong potential for reducing emissions at a regional scale by shifting trips from private vehicles to higher-capacity public modes. For example, the MTC Transit 2050+ assessment estimates a reduction of approximately 4.0 million passenger VMT per day in the Bay Area by 2035 [3], indicating a substantially larger impact on GHG emissions compared to individual roadway projects.

Active transportation strategies also contribute to reductions in VMT and emissions, although their impacts are typically localized and dependent on land use and network conditions. Vehicle electrification reduces GHG impact by lowering emissions intensity per mile traveled, though it does not directly affect VMT. Together, these findings suggest that roadway pricing effects and lower-carbon transportation investments should be evaluated separately before being integrated within a common emissions accounting framework that enables consistent comparison of program-level GHG impacts.

Table 1. summarizes the six key sources directly used to inform the representative assumptions applied in this report. Other studies in the full literature review provide important background evidence, but they are not analyzed in detail as separate case studies because they do not provide the same combination of California relevance or directly usable daily VMT or CO_2e units.

Table 1. Selected Studies and Key Evidence

Study / Source	Project Type	Method	Key Finding (VMT Impact)	Use in This Report
I-580 Managed Lane Case Study [1]	Priced Managed Lane	Empirical (synthetic control)	Increase in corridor VMT after implementation	Represents direct roadway pricing effect
CARB Managed Lanes Policy Brief [2]	Managed Lanes	Policy synthesis	Managed lanes may induce additional VMT when capacity increases	Supports interpretation of induced demand
MTC Transit 2050+ Assessment [3]	Transit Investment	Regional travel model	~4.0 million daily passenger VMT reduction predicted (Bay Area, 2035)	Represents large-scale transit implementation impact
MTC Vital Signs [6]	Regional Travel Data	Observed data	Provides regional VMT context for scaling	Supports statewide comparison
Caltrans Express Lanes Data [7]	Managed Lanes Network	System inventory	~500 miles of express lanes statewide	Used for scaling roadway impacts
Caltrans & Cal-ITP Ridership Data [8–16]	Transit	Administrative data	Identifies transit market share across regions	Used for scaling transit impacts

Key Results

California's on-road transportation system is estimated to produce about 426,000 metric tons of CO_2e per day in 2025 and is projected to decline to 356,000 metric tons per day in 2035 [4]. From 2025 to 2035, statewide VMT is anticipated to increase from 927 to 952 million miles per day, while the average emissions rate is expected to decline from 0.459 to 0.374 kilograms of CO_2e per VMT [4].

- A PML project does not necessarily reduce GHG emissions. When project implementation increases effective roadway capacity, the project can increase, rather than reduce, VMT [2].
- The I-580 eastbound case-study corridor represented about 0.1% of statewide daily VMT in 2025; the estimated post-treatment VMT from this specific case is attributable to a 0.009% increase of statewide daily VMT [1, 4].
- The direct I-580 managed-lane effect was about +81.4 thousand VMT per day, equivalent to about +30.4 metric tons of CO_2e per day in 2035 [1, 4].
- Caltrans reports that more than 500 miles of express lanes are currently in operation statewide [6]. Applying the I-580 direct effect as an illustrative scaling exercise yields a California express-lane analogue of about +3.99 million VMT per day, or +1,500 metric tons of CO_2e per day in 2035 [1, 4, 7]. As PML impacts are heterogeneous across corridors [1], this calculation is only a preliminary demonstration of the emissions accounting framework and not a statewide prediction.
- MTC's Transit 2050+ assessment reports a Bay Area reduction of 4.0 million passenger VMT per day in 2035, equal to about 0.4% of statewide daily VMT and about -1,500 metric tons of CO_2e per day [3, 4].
- Using Caltrans and California Integrated Travel Project (Cal-ITP) ridership totals for eight major California Regional Transportation Planning Agencies (RTPAs), the Bay Area represents about 38% of the transit market used in the statewide scaling step [8-16]. Applying the Bay Area transit as an illustrative scaling exercise yields about -10.7 million VMT per day and -4,000 metric tons of CO_2e per day in 2035, about 2.7 times the magnitude of the statewide express-lane analogue under the assumptions used in this demonstration [3, 4, 8-16].

Method

Data Sources

The statewide baseline of VMT, GHG totals, and emissions intensity by calendar year is derived from EMFAC2025 v2.1.0, the California Air Resources Board's emissions inventory and emissions modeling system for on-road motor vehicles in California [4]. The EMFAC output used in this report is a statewide daily inventory [4].

The direct managed-lane estimate comes from the Northern California case-study report authored by Jack Du, Xianyue Peng, and Micheal Zhang [1]. That report analyzes I-580 eastbound, detailing the baseline corridor VMT and the estimated post-treatment VMT gap relative to a synthetic-control counterfactual [1]. The interpretation of managed-lane effects is informed by the 2025 CARB managed-lanes policy brief, which notes that managed lanes can induce additional VMT when they add effective roadway capacity [2].

MTC Vital Signs reports observed daily VMT on Bay Area roads in 2024, which is used to place the Bay Area travel market in a statewide context [6]. MTC's July 2025 Transit 2050+ Network Performance Assessment: Performance Indicators Summary reports a modeled reduction in daily passenger VMT from 114 million to 110 million in 2035, which provides the direct transit comparison used here [3].

Two statewide scaling inputs are added for the California scaling exercises. First, Caltrans reports that more than 500 miles of express lanes are currently in operation statewide [8]. Second, Caltrans and Cal-ITP publish NTD annual ridership totals by RTPA; those pages are used to identify the Bay Area share of the major California transit markets included in this report [8–16].

The transit comparison uses two Bay Area sources because this report uses Northern California examples to demonstrate the proposed emissions-accounting framework within a consistent regional context. Complementary analyses of managed-lane projects in Southern California, including the I-405 HOV-to-HOT conversion and associated corridor improvements, are presented separately in Task 3 and are referenced later [5].

Statewide Aaseline from EMFAC2025

The statewide baseline is calculated by summing EMFAC values across all vehicle categories and fuel types for each calendar year [4]. Three greenhouse gases are included: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) [4].

To express these gases in a common unit, we use carbon dioxide equivalent, written as CO_2e. CO_2e converts methane and nitrous oxide into the amount of carbon dioxide that would produce the same warming effect over a 100-year period. The calculation used here is:

$$CO_2e = CO_2 + 28 \times CH_4 + 265 \times N_2O \text{ [17, 18]}$$

EMFAC reports the underlying gases in daily mass units. After the gases are converted to CO_2e, the resulting total is converted to metric tons per day for presentation in this report. Daily CO_2e is then divided by statewide daily VMT to obtain an average emissions rate, expressed in kilograms of CO_2e per vehicle mile traveled, as seen in Table 2. That rate is used to translate daily VMT changes from different project types into daily GHG changes [4]. From 2025 to 2035, statewide VMT increases by about 2.6 percent, but statewide CO_2e per day declines by about 16 percent because average fleet emissions intensity falls by about 19 percent [4].

Table 2. Statewide On-Road Baseline From EMFAC2025.

Year	Statewide VMT (million miles/day) [4]	CO_2e (metric tons/day)	Average CO_2e rate (kg per VMT)
2025	927	426,000	0.459
2035	952	356,000	0.374

Core Assumptions

Core assumptions and statistical inputs used in this report are summarized in Table 3. These assumptions and inputs establish a common emissions accounting framework by defining an emissions baseline, emissions conversion factors, case-study values, and parameters to translate daily VMT changes into corresponding CO_2e changes.

Table 3. Core Assumptions and Methodological Inputs Used in this Report

Item	Assumption
Analysis period	2025 baseline and 2035 comparison year [4].
Statewide units	Miles per day for VMT and metric tons per day for CO_2e, based on aggregated EMFAC2025 statewide daily output [4].
CO_2e calculation	$CO_2e = CO_2 + 28 \times CH_4 + 265 \times N_2O$, using 100-year global warming potentials from IPCC AR5 and EPA guidance [16, 17].
Managed lane direct effect	I-580 eastbound average post-treatment VMT gap of about +81,400 VMT per day, reported as a case-study result relative to a synthetic-control counterfactual [1].
Express-lane scaling basis	Caltrans reports that more than 500 miles of express lanes are in operation statewide; this report uses 500 miles as the current statewide express-lane scale parameter [7].
Transit comparison	Bay Area Transit 2050+ modeled reduction in daily passenger VMT from 114 million to 110 million in 2035, a reduction of 4.0 million VMT per day [3].
Observed Bay Area travel context	MTC Vital Signs reports 152 million daily VMT on Bay Area roads in 2024 [6].
Statewide transit scaling basis	The Bay Area share of major California transit markets is derived from Caltrans and Cal-ITP NTD annual ridership pages for MTC, Los Angeles, San Diego, Orange County, Sacramento, Riverside, San Bernardino, and Fresno [8–16].

Direct Managed-lane Estimate from I-580 Eastbound

The direct managed-lane estimate is taken from the I-580 eastbound case study [1]. The case study defines the analyzed segment as 10.2 miles long and reports a mean corridor VMT of 883,000 vehicle-miles per day [1]. Dividing corridor VMT by segment length implies an approximate one-direction traffic level of about 86,500 vehicles per day, assuming vehicles traverse the full segment [1].

The same case study reports an average post-treatment VMT gap of about +81,400 VMT per day relative to the synthetic-control counterfactual [1]. That value is retained in daily units. The resulting daily VMT increase is multiplied by the statewide EMFAC average emissions rate to express the direct change in CO_2e per day [1, 4] within the common emissions accounting framework. Metrics of the I-580 eastbound direct effect are summarized in Table 4.

Table 4. I-580 Eastbound Direct Effect in Statewide Context

Metric	Value
I-580 eastbound segment length	10.2 miles
Mean corridor VMT	883,000 VMT/day
Approximate one-direction traffic volume	86,500 vehicles/day
Share of statewide daily VMT	0.1%
Estimated VMT increase from case study [1]	+81,400 VMT/day
Increase as share of corridor VMT	9.2%
Increase as share of statewide daily VMT	0.009%
2025 CO_2e change [1, 4]	+37.4 metric tons/day
2035 CO_2e change [1, 4]	+30.4 metric tons/day

We did not directly model adjustments for regional VMT, route choice, transit trends, and project-specific counterfactual conditions in this report. Instead, we used a screening framework that converts project-level VMT changes into CO_2e based on a common statewide emissions baseline. More detailed project-level attribution, including regional VMT adjustment and route-choice analysis, is presented separately in Task 3 [5]. The present approach therefore emphasizes comparability across project types rather than causal attribution of project-specific VMT effects.

Transit Comparison and California-scale Contextualization

The transit comparison uses the Bay Area because the available published transit evidence is regional rather than corridor-specific. MTC Vital Signs reports that Bay Area roads carried 152 million daily vehicle-miles in 2024 [6]. Compared with the 2025 statewide EMFAC daily baseline, that observed travel market represents about 16 percent of statewide daily VMT [4, 6].

MTC's Transit 2050+ Network Performance Assessment: Performance Indicators Summary reports that daily passenger VMT in the Bay Area declines from 114 million to 110 million in 2035 when the Transit 2050+ network is included, a reduction of 4.0 million passenger VMT per day [3]. This is a 3.5 percent reduction within the modeled Bay Area passenger-VMT travel market. We placed the Bay Area result first in a statewide road-system context by comparing projected scenario VMT with statewide daily VMT [3, 4, 6], summarized in Table 5. We then considered Bay Area passenger VMT within a broader California transit-market context by comparing Bay Area ridership with the combined ridership reported for the major California RTPAs included in this illustrative scaling exercise [8–16].

Table 5. Bay Area Transit Comparison in Statewide Context

Metric	Value
Observed Bay Area daily VMT in 2024 [6]	152 million miles/day
Observed Bay Area share of statewide daily VMT [46]	16%
2035 Bay Area passenger VMT without Transit 2050+	114 million VMT/day
2035 Bay Area passenger VMT with Transit 2050+	110 million VMT/day
Modeled Bay Area passenger VMT reduction [3]	4.0 million VMT/day
Reduction within modeled Bay Area travel market	3.5%
Reduction as share of statewide daily VMT	0.4%
2035 CO_2e reduction	-1,500 metric tons/day

Results and Discussion

Table 6. shows four comparison scenarios. The first and third rows are the two observed scenario-based case-study inputs, and the second and fourth rows are California-scale contextualization derived from these same inputs. This structure shows how a corridor-level managed-lane effect and a regional transit effect are amplified when placed in a statewide network or market context.

Table 6. California-Scale Comparison Scenarios for Roadway and Transit Case-Study Evidence

Scenario	Scaling basis	VMT change (million miles/day)	2035 CO_2e change (metric tons/day)	Share of statewide 2035 VMT
Direct I-580 managed-lane effect	Observed I-580 eastbound case-study result [1]	+0.081	+30.4	0.009%
Current California express-lane network analogue	500 statewide express-lane miles / 10.2 I-580 miles = about 49 I-580 equivalents [7]	+3.99	+1,500	0.4%
Bay Area Transit 2050+ comparison	Observed Bay Area 2035 modeled transit effect [3]	-4.0	-1,500	0.4%
Major California transit-market analogue	1 / Bay Area share of major RTPA ridership = 2.67 Bay Area equivalents [8–16]	-10.7	-4,000	1.1%

The major RTPAs used in the transit scaling step are Metropolitan Transportation Commission, Los Angeles County Metropolitan Transportation Authority, San Diego Association of Governments, Orange County Transportation Authority, Sacramento Area Council of Governments, Riverside County Transportation Commission, San Bernardino County Transportation Authority, and Fresno Council of Governments [8–16].

The direct roadway result from the I-580 case study is an increase in VMT rather than a decrease. Under the case-study estimate, daily VMT increases by 81,400, or about 9.2 percent of corridor VMT. Applied to the 2035 statewide average emissions rate, that equals about 30.4 metric tons of CO_2e per day [1, 4]. This result is consistent with CARB's discussion of managed lanes: when a facility increases effective roadway capacity, it can attract additional vehicle travel [2]. The Southern California I-405 HOV-to-HOT case further demonstrates that this increase in VMT can occur: although observed corridor VMT and emissions declined in a direct 2017-

to-2024 comparison, the regional-adjusted analysis suggests that the improved corridor attracted more traffic than would have been expected under broader Orange County highway VMT trends [5].

Travel on the I-580 corridor is little, relative to the statewide network of highways and express-lanes. The corridor carried about 0.1 percent of statewide daily VMT in 2025, and the added VMT from the case study is about 0.009 percent of statewide daily VMT [1, 4]. At the same time, the 10.2-mile eastbound facility represents about 2.0 percent of the more-than-500-mile express-lane network that Caltrans reports is currently in operation statewide [1, 7]. For this analysis, using that network scale produces a California express-lane analogue of about +4.0 million VMT per day and +1,500 metric tons of CO_2e per day in 2035 [1, 4, 7].

The Bay Area transit result is larger than the direct I-580 corridor result, even before statewide scaling. MTC's Transit 2050+ comparison reduces Bay Area passenger VMT by 4.0 million miles per day in 2035, which translates to about 1,500 metric tons of CO_2e reduction per day using the statewide EMFAC emissions rate [3, 4]. That reduction is about 49.2 times the magnitude of the direct I-580 managed-lane effect in 2035 [1, 3, 4].

A second scaling step places the Bay Area transit result in the California statewide context. The Bay Area accounts for about 16% of statewide road VMT [4, 6]. It also accounts for about 38% of the combined unlinked passenger trips reported for the eight major California RTPAs used in this report [8–16]. Under that transit-market scaling assumption, a Bay Area Transit 2050+-type program corresponds to a decrease of about 10.7 million VMT per day and a reduction of 4,000 metric tons of CO_2e per day in 2035 across major California transit markets [3, 4, 8–16].

Three conclusions follow from these results. First, a PML project should not be assigned a GHG reduction without evidence of its direct VMT effect, as a project can induce heterogenous VMT effects and is extremely context dependent on regional travel, roadway design, pricing strategies, and elected model adjustments. Second, corridor evidence should be contextualized to the size of the California transportation network before being compared with statewide travel and emissions totals. Third, expressing roadway and transit case studies within a common emissions accounting framework enables comparison of their relative magnitude. In this example, the major California transit-market analogue is about 2.7 times the magnitude of the current statewide express-lane analogue, for a net difference of about -2,500 metric tons of CO_2e per day in 2035 [3, 4, 7–16]. Future evaluations should also consider effects of PML projects on the distribution of VMT across the transportation network, including on corridors and local routes.

Conclusion

This report demonstrates a preliminary screening framework for assessing GHG effects from CRP project types. The method starts with a statewide EMFAC baseline, converts project-level VMT changes to CO_2e using the statewide average emissions rate, and then illustratively scales scenario-based case-study project projections to California using observed network size or market share [4]. Based on the evidence available here, the direct result of the I-580 managed-lane project was an increase in VMT and CO_2e, the Bay Area transit result was a decrease in VMT and CO_2e, and the statewide balance depends on the relative scale of the roadway and lower-carbon components of the program [1, 3, 7].

Transportation projects can affect travel demand and emissions through different mechanisms and at different spatial scales [1–3]. Thus, statewide GHG accounting should evaluate direct roadway effects and lower-carbon reinvestment effects separately before integrating them within a common emissions accounting framework. This allows corridor-level and regional evidence to be expressed in comparable units and contextualized within statewide travel and emissions totals. As additional California case studies become available, and as more advanced statistical methods are developed to synthesize heterogeneous project outcomes, the framework may support more robust statewide assessments of CRP-related investments. Future work may also incorporate regional travel-demand adjustments and origin-destination analyses to better distinguish project effects from broader changes in travel behavior.

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Appendix 1: Literature Review on CRP Projects and the Effects on VMT and GHG

Click the link below to get access to or download the Literature Review Table.

CRP_LR.xlsx