

CONNECT SOCIAL 2024

The 2024–2050 Regional Transportation Plan/Sustainable Communities Strategy
of the Southern California Association of Governments

Economic Impact Analysis

TECHNICAL REPORT

ADOPTED APRIL 4, 2024



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1. EXECUTIVE SUMMARY

This Technical Report estimates the economic impacts of Connect SoCal 2024 (“the Plan”) planned projects on the SCAG Region economy. Expenditures on Connect SoCal 2024 transportation projects create jobs and output in the region from direct investment in the design, construction, maintenance, and operation of the region’s transportation infrastructure. This investment increases transportation network efficiency by reducing the cost of transporting goods and people and making our region more attractive to live and do business. Moreover, these investments lead to additional economic benefits, or “co-benefits,” including improved environmental quality and health outcomes.

The SCAG County Transportation Commissions provide planned transportation expenditure data for the planning horizon, spanning FY2025-FY2050. Based on these data and SCAG’s regional demographic and employment projections, SCAG estimates how the 2024 Plan will change the region’s network efficiency. Using the REMI TranSight model, SCAG assesses the economic impacts of Connect SoCal 2024 by estimating the job and GDP growth arising from the Plan’s transportation infrastructure investments (REMI 2023). SCAG also computes the value of the Plan’s co-benefits in terms of the value of reduced greenhouse gas emissions.

Over the FY2025–FY2050 planning period, the SCAG Region will invest \$752 billion (\$414 billion in 2023 constant dollars) on transportation improvement projects through Connect SoCal 2024. The analyses in this report show that over this period and across the six-county SCAG Region, the Plan implementation will generate an average of 279,000 jobs each year and increase regional Gross Domestic Product (GDP) by an annual average of \$19.4 billion (2023 constant dollars). In addition, Plan implementation will improve the region’s transportation efficiency, thus increasing the region’s competitiveness and economic performance. These improvements will increase average annual job gains to 465,000 jobs and yearly average GDP by \$46.1 billion (2023 constant dollars).

Connect SoCal 2024 could benefit the SCAG Region beyond job and GDP gains. The contribution of the Plan to reducing GHG emissions and climate risk could bring economic benefits by avoiding future costs and facilitating a smoother transition to a low-carbon economy. Plan implementation would measurably reduce GHG emissions from light and medium duty vehicles, building energy use and water energy use by a combined 67 million metric tons (MMT), generating \$5.7 billion (2023 constant dollars) in benefits. Connect SoCal 2024 aims to build transportation projects and effectively distribute resources and investments to reach VMT reduction goals while enhancing regional mobility. Such efforts to meet GHG emissions targets will mitigate the risks from climate change, both globally and locally, fortifying the region’s resilience. This resilience will further the region’s economic vitality and opportunities for sustainable development.

While the Plan offers significant economic benefits, two key challenges can potentially diminish the Plan’s promises: inequity and inadequate housing. The region faces substantial inequities, particularly with respect to wages, which harms the individuals facing inequitable treatment, but also dampens the entire regional economy. The analysis in this report finds that regional GDP would be 17 percent higher if wage inequities in the region were eliminated. The employment growth projections underlying the economic impact analysis assume that the region will achieve adequate housing supply during the planning period. Failure to do so will reduce expected job growth by over 7 percent.

2. BACKGROUND

Since 2012, SCAG has analyzed and documented the relationship between transportation infrastructure investment in SCAG's Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) and the resulting economic growth and job creation. This analysis was especially important at that time as the region was emerging from the economic shock of the Great Recession (2007-2009). The Great Recession hit Southern California especially hard in terms of high unemployment across the region. At that time, SCAG's leadership recognized the growing but underappreciated importance of understanding the economic impacts of SCAG's 2008-2035 RTP/SCS ("2012 Plan"). Therefore, SCAG embarked on the initial economic impact analysis of its RTP/SCS. Since the approval of the 2012 Plan, SCAG-region Gross Domestic Product ("GDP") has grown 25 percent. Indeed, the 2012 RTP/SCS transportation investments significantly contributed to the region's economic recovery from the Great Recession.

In 2023, the economic impacts of Connect SoCal 2024 on the SCAG Region economy are at least as important, if not more. The SCAG Region is in a similar situation recovering from the economic shock of the COVID-19 pandemic, which upended nearly every aspect of the regional (and global) economy. COVID-19 had unprecedented impacts on the labor market. For example, pandemic-induced workplace closures drastically changed commuting patterns and employment locations. The pandemic accelerated the decades-long increasing trend of remote and hybrid work, and because of pandemic-induced technological and cultural change, remote and hybrid work are likely to persist into the foreseeable future (Barrero, Bloom, and David 2023).

The SCAG Region has proven resilient in its recovery from the short but sharp COVID-19 recession. Connect SoCal 2024 investments, policies, and strategies strive to be more than the sum of their parts and capture synergies for the Plan. The intent is to fulfill the Plan's vision of a healthy, prosperous, accessible, and connected region for a more resilient and equitable future. SCAG defines resilience as the SCAG Region's built, social, economic, and natural systems' capacity to anticipate and effectively respond to changing conditions, acute shocks, and chronic stressors by creating multiple opportunities for a sustainable, thriving, and equitable future (for more detail, see the Land Use and Communities Technical Report). Connect SoCal 2024 adds important emerging priorities for the region: a plan that fosters regional resilience, equitable and inclusive economic growth for all SCAG Region residents.

Connect SoCal 2024 outlines strategies for investing in local and regional transportation infrastructure. This Technical Report quantifies the economic impacts of the Plan's transportation infrastructure investments and considers the potential benefits from the non-structural ("soft") investments, policies, and strategies embodied in the Plan. These soft investments bring benefits to the region beyond the economic growth created by building, operating, and maintaining transportation infrastructure. Overall, implementing the 2024 Plan will benefit the Southern California region by creating jobs and economic growth, reducing impacts on the environment, and increasing the region's competitive advantage in the global economy.

Connect SoCal 2024 details SCAG Region transportation spending exceeding \$414 billion (constant 2023 dollars) that is planned between FY2025 and FY2050. The Transportation Finance Technical Report reports this amount in nominal terms at \$752 billion. This report is focused on economic changes over time and reports expenditures in constant 2023 dollars, assuming a 4 percent real discount rate to compute present values. Presenting results in present value terms adjusts for expected future inflation and the time value of money.

The economic impact analysis in this Technical Report shows that the Plan will create jobs in highway and rail design, construction, operation, and maintenance and from improved transportation network efficiency. In addition, the Plan will bring value to the region by reducing greenhouse gas emissions (GHG) and other pollutants, ultimately improving quality of life in the region.

Achieving the Plan's promise of economic growth requires us to recognize that the region faces significant income inequality. For example, in terms of average wages reported by the American Community Survey, in 2021 in the SCAG Region,

- Hispanic workers earned 56 percent of White worker wages,
- Black workers earned 72 percent of White worker wages, and
- Women earned 81 percent of men's wages.

Inadequate housing supply and affordability are ongoing obstacles to the region's growth. In 2021,

- 9.7 percent of the region's households lived in overcrowded housing compared to 7.0 percent for the rest of California and 3.4 percent for the U.S., and
- Housing costs overburdened 45 percent of the region's households (i.e., spending over 30 percent of income on housing) compared to 39 percent in the rest of California and 32 percent in the U.S.

Overcrowded housing is defined as housing units with 1 or more persons per room (American Community Survey 1-Year Estimates, 2021).

This report shows that reducing the income gaps faced by the region's workers of color and women could increase the entire region's economic output by 17 percent. Moreover, failing to accelerate regional housing production could put several hundred thousand projected jobs at risk during the Plan period. For a more in-depth discussion of equity and housing in the region, please see Equity Analysis Technical Report and the Housing Technical Report.

Connect SoCal 2024 brings opportunities for job growth and economic prosperity to the region through investment in the Region's transportation infrastructure and by meeting our sustainability targets. Transportation investments coupled with equitable growth strategies and adequate housing supply can amplify the economic benefits of implementing the Plan and ensure that these benefits accrue to all of SCAG's residents.

3. ECONOMIC IMPACT ANALYSIS OF TRANSPORTATION INVESTMENTS

Investment in the region's transportation infrastructure is the largest component of the Plan. The economic impacts of infrastructure investments can be quantified using a decision-making tool known as economic impact analysis.

3.1 OVERVIEW OF ECONOMIC IMPACT ANALYSIS

Economic impact analysis is a technique used to estimate the effects of economic changes in a regional economy. Economic impact analysis is grounded in the idea that each dollar spent in a region stimulates additional economic activity and multiplies, or ripples, through the economy, called the "multiplier effect." The multiplier effect captures the incremental output, employment, personal income, and government revenue in the region that exceeds the initial investment. This section describes the application of this technique to assess the economic impacts of Connect SoCal 2024 transportation infrastructure investments.

To implement Connect SoCal 2024, workers will be employed to design, build, operate and maintain transportation projects. These new jobs are called the "direct effect" of this expenditure. In addition, these new jobs will also ripple throughout the economy, creating additional jobs through indirect and induced effects. The combined effect is referred to as the "total effect."

Jobs in companies that supply goods and services to the new projects make up the indirect effects of the investments in the Plan's transportation infrastructure projects. The firms and agencies that build and maintain the transportation system buy materials, office supplies and business services. All purchases necessitated by this spending are indirect effects – the jobs required to supply inputs (both goods and services) to support the direct investment.

Changes in consumer spending due to increased employment and wages from Plan projects are the induced effects of these projects. These are the additional jobs required to support new spending by the employees hired to work directly on Connect SoCal 2024 projects or in support (indirect) industries. These employees use their wages to make consumer discretionary purchases of goods and services – such as housing, food, clothing, entertainment, and the like.

When quantifying the economic impacts of Connect SoCal 2024 investments, we make several assumptions:

- The current distribution of employment across industrial sectors persists throughout the study period.
- Economic changes induced by Plan investments occur gradually.
- Impacts from implementing the Plan make up a relatively small share of the total regional economy.
- The fundamental supply and demand relationships in the region remain relatively stable during the study period (e.g., no major economic disruptions such as pandemics or wars).

SCAG conducts this economic impact analysis using REMI's TranSight 5.1 (REMI 2023). TranSight is a dynamic economic model designed to capture the key relationships in the regional economy and the

effects of changes in transportation systems. REMI TranSight is calibrated to the SCAG Region economy and relies on extensive data resources from the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Department of Energy, the Census Bureau, and other public sources. SCAG's data on transportation finance expenditures and results from SCAG's Activity Based Model are custom inputs to TranSight. The TranSight model accounts for changes in prices, wage rates, migration patterns, labor participation, commuting and trade flows within and between regions generated from movements in supply and demand.

REMI TranSight is well-suited for evaluating Connect SoCal 2024 transportation investments because the model captures both market dynamics and changes in consumer behavior. It does this by modeling the flow of goods, services, and money among different sectors in the regional economy. Unlike other economic impact analysis tools, REMI also incorporates econometric models of consumer and firm migration in and out of the SCAG Region, capturing broader socioeconomic responses beyond industry linkages. Moreover, TranSight's dynamic structure allows modeling of the impacts of the transportation projects over time and quantify these impacts for each year in the study period.

3.2 ECONOMIC IMPACT ANALYSIS INPUTS AND RESULTS

A key step in an economic impact analysis is to set up the scenario for which we would like to measure economic impacts. The scenario defines the expected changes that Connect SoCal 2024 projects trigger and the timeframe for measuring these impacts. The expected economic changes arising from Plan investments are the "policy variables" in the model. The analysis timeframe is from FY2025 to FY2050. The analysis focuses on two key policy variables: transportation investment expenditures and improvements in transportation network efficiency.

3.2.1 TRANSPORTATION INVESTMENT EXPENDITURES

Transportation construction projects represent government expenditures over the lifetime of the projects programmed in Connect SoCal 2024. Project construction costs, as well as project operations and maintenance costs are TranSight model inputs. The model represents increased transportation expenditures as increased demand for region-wide construction industry services, which impacts sales, employment, and other variables. Construction and operating costs may vary significantly based on the types of projects. For example, public transit generally incurs large, continuous operating and depreciation costs, in contrast to road infrastructure projects that may require less upkeep.

The Plan's transportation investments will require firms and agencies to hire workers in the design and construction of highways and rail systems and transportation and transit system operations and maintenance. Each county transportation commission provides transportation expenditures data. Data for this policy variable are summarized in the Transportation Finance Technical Report and in Table 1. Not all expenditures will have an economic impact. Specifically, we exclude debt service expenditures from Table 1 since these do not represent future investments in regional infrastructure; rather, debt service reflects past expenditure (see Transportation Finance Technical Report for detailed information). The data in Table 1 are entered into TranSight for each county and year of expenditure.

A mix of transportation projects are planned in the six SCAG counties over the 26-year model timeframe. The Transportation Finance Technical Report reports this amount in nominal terms at \$752 billion (\$414 billion in constant 2023 dollars). This report is focused on economic changes over time and reports

expenditures in constant 2023 dollars, assuming a 4 percent real discount rate when presenting future values in present value terms. Presenting results in present value terms adjusts for expected future inflation and the time value of money. Nearly 60 percent of Plan project expenditures will be spent on projects in Los Angeles County and 39 percent on operation and maintenance of the region's multi-modal transportation infrastructure.

Table 1. Connect SoCal 2024 Region-Wide Transportation Expenditures by Category and Fiscal Year

SCAG Region 2024 Plan Expenditures (2023 Dollars, Billions)							
Expenditure Category	NAICS Codes	FY2025- FY2029	FY2030- FY2034	FY2035- FY2039	FY2040- FY2044	FY2045- FY2050	Total
Highway Construction	23	\$12.5	\$8.8	\$7.5	\$10.1	\$9.9	\$48.9
Highway Design	54	\$1.9	\$1.9	\$2.7	\$2.5	\$3.0	\$12.0
Highway Operation and Maintenance	23	\$7.0	\$7.2	\$8.5	\$8.6	\$10.3	\$41.5
Local Streets and Roads Construction	23	\$6.3	\$4.0	\$3.4	\$1.6	\$1.5	\$16.8
Local Streets and Roads Operation & Maintenance	23	\$6.6	\$6.8	\$12.6	\$10.7	\$11.0	\$47.8
Multi Modal Construction	23	\$19.7	\$19.0	\$14.9	\$11.5	\$12.8	\$77.8
Multi Modal Design	54	\$1.3	\$1.1	\$2.4	\$2.2	\$2.3	\$9.4
Multi Modal Operation & Maintenance	48, 33	\$26.3	\$26.7	\$34.6	\$33.2	\$39.4	\$160.1
Total Expenditures		\$81.62	\$75.5	\$86.6	\$80.4	\$90.2	\$414.3

Notes and Sources: Amounts shown in present value terms, assuming a 4 percent real discount rate (Caltrans B/C 2021) to account for future expected inflation and the time value of money. Based on nominal expenditures reported in the Transportation Finance Technical Report (SCAG 2024). Numbers might not sum to total due to rounding.

3.2.2 PLAN TRANSPORTATION INFRASTRUCTURE ECONOMIC IMPACTS

Error! Reference source not found. shows the annual average jobs from the Connect SoCal 2024 spending. This is a traditional economic analysis, modeling the stimulus from new spending in the form of total effects: The sum of direct jobs and multiplier effects (indirect and induced effects). The jobs impact is reported as annual average jobs added in five-year periods (starting with FY2025) for each county and the SCAG Region. The last column in Error! Reference source not found. shows jobs, averaged over all plan years, from the Plan’s construction, operations, and maintenance spending.

Table 2. Jobs from Plan Infrastructure Spending (thousands of jobs)

Region	Average Annual Jobs Created (Thousands of Jobs)					Planning Period Average
	FY2025 - FY2029	FY2030 - FY2034	FY2035 - FY2039	FY2040 - FY2044	FY2045 - FY2050	
SCAG Region	309.1	263.8	313.7	292.2	236.0	279.5
Imperial County	0.2	0.7	0.5	0.2	0.1	0.3
Los Angeles County	215.5	196.1	227.4	205.8	170.6	200.7
Orange County	27.4	28.4	34.8	29.1	26.2	29.0
Riverside County	34.0	21.4	26.4	33.0	19.2	26.2
San Bernardino County	27.3	13.0	19.4	19.7	12.2	17.9
Ventura County	4.6	4.2	5.1	4.4	7.7	5.4

Source: REMI TranSight (2023), Transportation Finance Technical Report (SCAG 2024). Numbers might not sum to total due to rounding

Over the 26-year planning period, the Plan transportation infrastructure investments will generate an annual average of 279,000 jobs in the SCAG Region. More than 71 percent of these will fall in Los Angeles County, 10 percent in Orange County and 9 percent in Riverside County. Comparing estimated job growth in Error! Reference source not found. to expenditures in Table 1, shows that jobs grow with transportation expenditures. The lower job growth in FY2045-FY2050 is partially due to the expected slower growth in population and labor force due to an aging population.

In addition to jobs, growth in gross domestic product (GDP) also informs how Connect SoCal 2024 affects the regional economy. A region’s GDP measures the total value-added of goods and services produced and provides information about the region’s overall economic health. Error! Reference source not found. reports the estimated GDP growth associated with the Plan’s expenditures. Over the entire planning period, real GDP is expected to grow \$19.4 billion annually on average. While 71 percent of the job growth is expected in Los Angeles County, less than 50 percent of GDP growth is expected in Los Angeles County, nearly 20 percent in Orange County and 16 percent in Riverside County.

Table 3. Real GDP Growth from Connect SoCal 2024 Transportation Expenditures

Average Annual GDP Change (Billions 2023 Dollars)						
Region	FY2025 - FY2029	FY2030 - FY2034	FY2035 - FY2039	FY2040 - FY2044	FY2045 - FY2050	Planning Period Average
SCAG Region	20.0	17.1	20.9	21.1	18.4	19.4
Imperial County	0.0	0.1	0.1	0.0	0.0	0.1
Los Angeles County	10.0	9.2	10.2	9.9	9.2	9.6
Orange County	3.2	3.5	4.5	4.0	3.8	3.8
Riverside County	3.4	2.4	3.1	4.1	2.6	3.1
San Bernardino County	2.9	1.5	2.4	2.6	1.7	2.2
Ventura County	0.5	0.5	0.7	0.6	1.1	0.7

Notes and Sources: Amounts shown in present value terms, assuming a 4 percent real discount rate (Caltrans B/C 2021) to account for future expected inflation and the time value of money. Amounts based on nominal expenditures reported in the Transportation Finance Technical Report (SCAG 2024). Analysis conducted in REMI TranSight (2023). Numbers might not sum to total due to rounding.

4. ECONOMIC IMPACTS OF OVERALL CONNECT SOCIAL 2024

Connect SoCal 2024 transportation investments also improve the regional transportation network efficiency, improving the regional transportation system's ability to get goods and people from point A to point B quickly, safely, and reliably with minimal delays, congestion, resource use, and environmental impact. In line with the goals of Connect SoCal 2024, the Plan transportation investments improve transportation network efficiency by reducing traffic congestion, improving accessibility, and enhancing access to public transportation (see the Performance Monitoring Technical Report). Moreover, improved network efficiency may lead to increased spending on restaurants, retailers, and labor force access for businesses near transportation hubs.

The Plan's policies and strategies will also create jobs by improving regional competitiveness and making the region a better place to live because of improved transportation network efficiency. Scholars have long understood that public infrastructure investments create direct jobs and additional multiplier effects from those jobs. Furthermore, economic research has illuminated how transportation spending improves regional firms' productivity via a more efficient transportation system. A well-planned, well-funded, and well-functioning transportation system and integrated land use patterns can allow firms to communicate and conduct business with one another more quickly, draw workers from larger labor market pools, and ship and receive goods and services at lower costs. All this boosts overall regional economic activity. A more efficient transportation network improves the region's ability to respond to economic shocks, such as recessions, by increasing network reliability, reducing transportation costs, and improving safety, thus contributing to the region's economic resilience.

4.1 NETWORK EFFICIENCY AND ECONOMIC COMPETITIVENESS

Investment in the region's transportation infrastructure improves network efficiency and reduces the cost of travel by reducing congestion and pollution. This section explores the economic impact of improved network efficiency. SCAG uses an activity-based regional travel demand model (ABM), following federal guidelines and SCAG Model Peer Review Committee recommendations. The model covers the entire SCAG Region and relies on data about current and future population and household characteristics, highway networks, transit networks, transit services, and various trip data. The SCAG ABM undergoes extensive validation and is calibrated to 2019 travel conditions (see Transportation Conformity Analysis Technical Report).

The SCAG ABM measures the network efficiency improvements from Connect SoCal 2024 planned projects. The ABM results enter REMI TranSight as a reduction in travel costs. REMI TranSight calculates how consumer, household and business behavior responds to changes within a travel network using vehicle miles traveled (VMT), vehicle hours traveled (VHT), and the number of trips from the ABM model estimates.

4.2 PROJECTED ECONOMIC IMPACTS

In the previous section, we presented the economic impacts of transportation infrastructure investments, excluding any improvements to the transportation network. However, these investments will reduce the cost of transporting goods and services (Laube et al. 2014). Additional jobs will flow from these improvements to the transportation network, resulting in network efficiencies and improved regional economic and business competitiveness.

4.2.1 IMPACTS FROM ENHANCED NETWORK EFFICIENCY

Two major shifts over the past several decades have made transportation access an even more important part of regional economies. Metropolitan economies increasingly rely on the value of proximity—what urban economists call “agglomeration economies,” or the propensity of successful local economies to cluster. This proximity, however, has a major side effect, increased traffic congestion, which can limit economic growth once it reaches a certain point. Economists believe traffic congestion has cost the Los Angeles metropolitan area more than 100,000 new jobs, dragging down overall economic activity (Hymel 2009).

Firms benefit from being near other firms in the same industry. They create a concentrated industry cluster, such as Silicon Valley or Hollywood, allowing an environment of shared ideas, talent, and interaction. However, severe traffic congestion – a result of the region’s historical development pattern which underprioritized alternative transportation modes like transit – can limit these interactions, thus limiting potential innovation.

One of the main ways it does this is by limiting face-to-face interaction, which studies show increases productivity. Zoom meetings cannot fully replace the nuances of interpersonal interaction. Current work from home (WFH) trends suggest that an increasing number of people who were fully remote during the pandemic are shifting to hybrid work and returning to the office one or more days each week. Increasing transportation access does not just help businesses, workers, and residents. It also contributes to lively, walkable, and more complete neighborhoods and communities more conducive to serendipitous meetings and face-to-face communication. These are described in the Land Use and Communities Technical Report as 15-minute communities. A 15-minute community is one in which people can access most or all their day-to-day needs, services, and amenities within a 15-minute walk, bike, or roll or reducing the length or number of trips by bringing key destinations closer together and as places that due to increased proximity of complementary uses result in reduced and/or shorter trips.

Transportation access increases regional economic competitiveness in five main ways.

1. **Improved labor market matching:** Reducing travel time allows firms to hire from a larger geographic area. This increases the firm’s labor market, particularly in a large urban area like the SCAG Region, where reductions in commuting time can yield access to many more potential employees. This increases each firm’s productivity and efficiency.
2. **Enhanced economic competitiveness attracting new firms:** If the region’s transportation system supports more efficient commutes, employers will be encouraged to draw from larger labor market pools. And if that larger employee pool allows firms to hire better employees, eventually, those firms will move into the region in response to those improved hiring prospects, especially firms that depend on a skilled workforce. This, in turn, will help attract new businesses to the region.
3. **Reduced congestion increases labor supply:** Metropolitan regions compete for mobile labor. That means that those regions with lower traffic congestion will (when all else is equal) lure more migrants by offering the value proposition of shorter commute times. This increases the supply of available labor. On the other hand, metropolitan areas with long commutes need to offset this with higher wages, lower home prices or both. Reduced congestion can attract more workers to a region, allowing a firm to hire quality workers at reasonable wages.

- 4. **Larger markets for firms’ products and services:** Reductions in travel time also can allow firms to supply a larger market area, leading to increased economic competitiveness and regional job growth. One example is the goods movement/freight traffic that moves through the Ports of Los Angeles and Long Beach. Larger ports can build infrastructure that speeds up the processing of shipments, therefore lowering costs. Supply chain managers favor Southern California because of the speed and reliability that goods can be moved around the region and to the rest of the nation. As the economy expands, however, congestion begins to rob the area of this competitive advantage, making infrastructure investments key to retaining it.

- 5. **Innovation:** Cities have become engines of innovation in the knowledge-based economy, driving advances in consumer products, technology, medicine, consumer services, retailing and logistics, and entertainment and fine arts. This is because proximity leads to interaction and innovation; boosting this interconnectivity via increased transportation access will thus also boost interaction and innovation. Improvement to the transportation infrastructure will enhance key cluster industries in the SCAG Region that support innovation.

Network efficiency in the form of improved transportation access is a second source of job growth. Connect SoCal 2024 project expenditures will result in improved network efficiency. Table 2 shows the estimated added jobs, and Table 3 shows the increase in GDP from the Plan expenditures and the improved economic competitiveness that results from network benefits. Network benefits flow from reduced commuting, improved accessibility, and lower transport costs as defined above. Operations benefit from the changes in amenities and reduced costs.

Table 2. Increased Jobs from Connect SoCal 2024 Expenditures and Improved Network Efficiency

Region	Average Annual Jobs Created (Thousands of Jobs)					Planning Period Average
	FY2025 - FY2029	FY2030 - FY2034	FY2035 - FY2039	FY2040 - FY2044	FY2045 - FY2050	
SCAG Region	364.9	392.1	506.6	523.5	515.2	464.5
Imperial County	0.3	1.0	0.9	0.7	0.8	0.7
Los Angeles County	254.0	282.3	350.2	332.3	301.6	303.9
Orange County	35.5	47.6	66.7	73.9	87.9	64.2
Riverside County	40.3	36.1	50.2	67.7	67.5	53.5
San Bernardino County	30.3	20.0	31.7	41.4	45.2	34.6
Ventura County	4.4	5.2	7.0	7.5	12.2	7.6

Source: Transportation Finance Technical Report (SCAG 2024), SCAG Connect SoCal 2024 Transportation Activity-Based Model, REMI 5.1 (2023). Numbers may not sum to total due to rounding.

Table 3. Increased GDP from Connect SoCal 2024 Expenditures and Improved Network Efficiency

Region	Average Annual GDP Change (Billions 2023 Dollars)					Planning Period Average
	FY2025 - FY2029	FY2030 - FY2034	FY2035 - FY2039	FY2040 - FY2044	FY2045 - FY2050	
SCAG Region	26.9	33.9	47.4	54.5	61.5	46.1
Imperial County	0.0	0.1	0.0	0.0	0.0	0.0
Los Angeles County	14.7	20.4	27.0	28.0	29.1	24.2
Orange County	4.4	6.5	9.8	11.7	15.1	9.9
Riverside County	4.0	4.0	5.9	8.5	9.3	6.6
San Bernardino County	3.2	2.3	3.7	5.2	6.1	4.3
Ventura County	0.6	0.7	0.9	1.1	1.8	1.1

Notes and Sources: Amounts shown in present value terms, assuming a 4 percent real discount rate (Caltrans B/C 2021) to account for future expected inflation and the time value of money. Amounts based on nominal expenditures reported in the Transportation Finance Technical Report (SCAG 2024). Analysis conducted in REMI TranSight (2023). Numbers might not sum to total due to rounding.

The REMI model results show that the Plan expenditures and resulting network benefits would result in an average of 465,000 jobs added each year of the Plan and increase GDP by \$46 billion (2023 constant dollars) annually, on average. These improvements in both jobs and GDP result from the increased competitiveness that would flow from full implementation of the Plan. The economic competitiveness of jobs grows over time, as the effect of Connect SoCal 2024 relative to baseline results in cumulative network efficiencies over the course of the Plan.

4.3 CLIMATE CO-BENEFITS OF CONNECT SOCIAL 2024

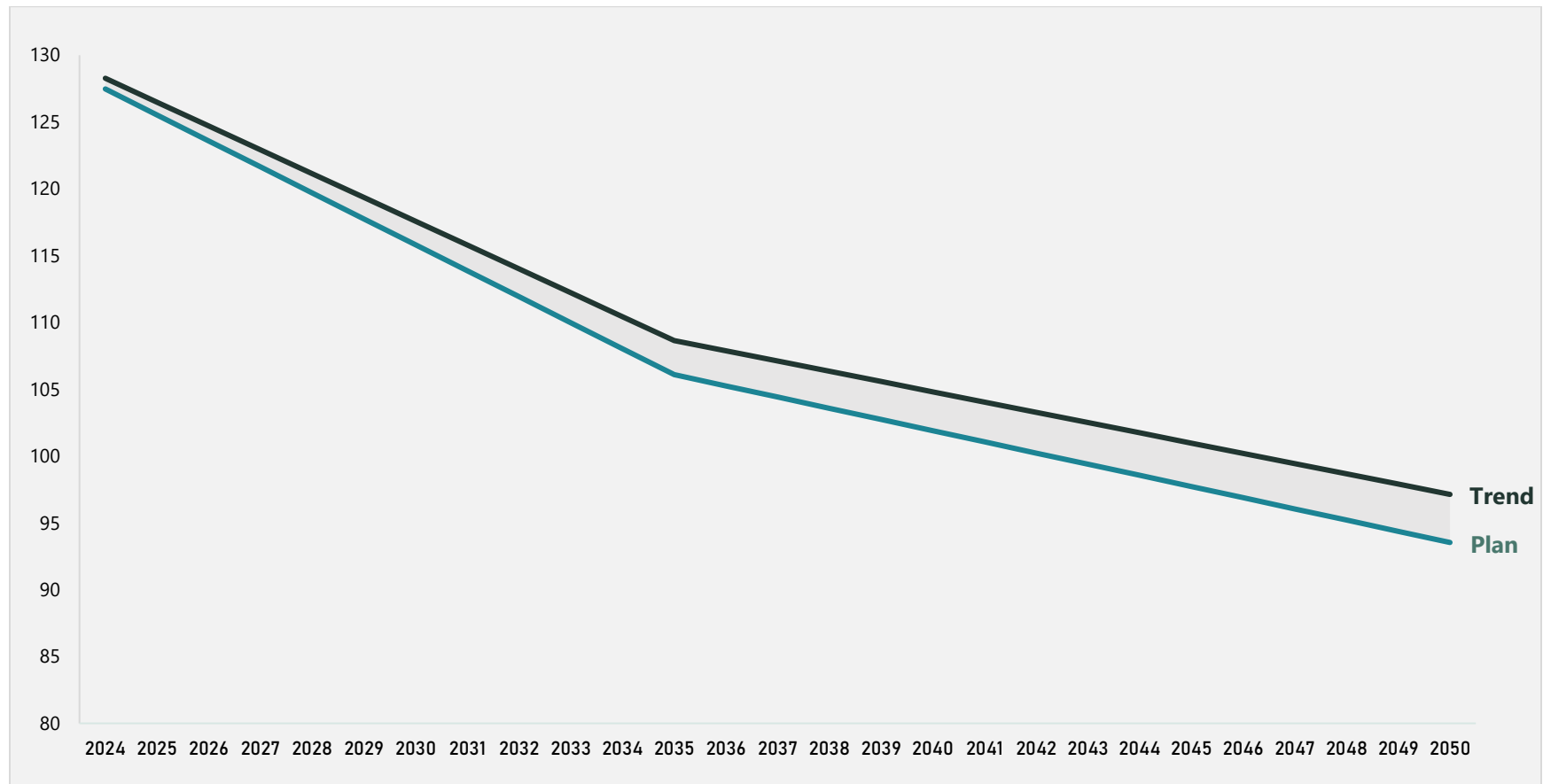
In addition to generating growth in economic output and jobs in the region, as shown in the previous section, Connect SoCal 2024 transportation investments positively impact the region and the environment in several ways. We refer to these ancillary positive impacts as “co-benefits.” Co-benefits create a “win-win” by providing additional benefits, above and beyond getting people from point A to point B. While models such as REMI TranSight are useful for capturing the key supply and demand interactions in the regional economy, these models are necessarily incomplete. Many impacts to the economy from Connect SoCal 2024 transportation infrastructure and Plan implementation strategies are too complex to incorporate into such models.

In addition to the benefits quantified above, Connect SoCal investments and strategies help improve air quality, public health, and equity (Kwan and Hashim 2016). The Performance Monitoring Technical Report documents several outcomes from the Plan investments that are “co-benefits” of the Plan. Because of its importance to the Plan’s statutory obligations and regional planning policies, this section focuses on the reduction of GHG emissions associated with Plan implementation.

Based on SCAG ABM outputs, the 2024 Plan's transportation strategies will reduce GHG emissions from light and medium duty vehicles by 51.2 MMT between 2024 and 2050 (Transportation Conformity Analysis, Land Use and Communities Technical Report, and Performance Monitoring Technical Report). In addition to transportation-specific GHG emissions reductions, SCAG's Scenario Planning Model (SPM) estimates additional GHG emissions reductions from the Plan's forecasted development patterns and additional implementation strategies on building energy use and water energy use. The SPM model estimates an additional 15.7 MMT of GHG reductions. The Land Use and Communities Technical Report provides more details.

Figure 1 plots the estimated GHG reductions during the Plan period for the business-as-usual scenario ("trend") and a scenario where the 2024 Plan is implemented. The difference between the two is the total reduced GHG and is shown as the shaded area in Figure 1. Detailed calculations are provided in the Appendix to this report.

Figure 1. Trend vs. Plan Greenhouse Gas Emissions, 2024-2050 (Million Metric Tons)



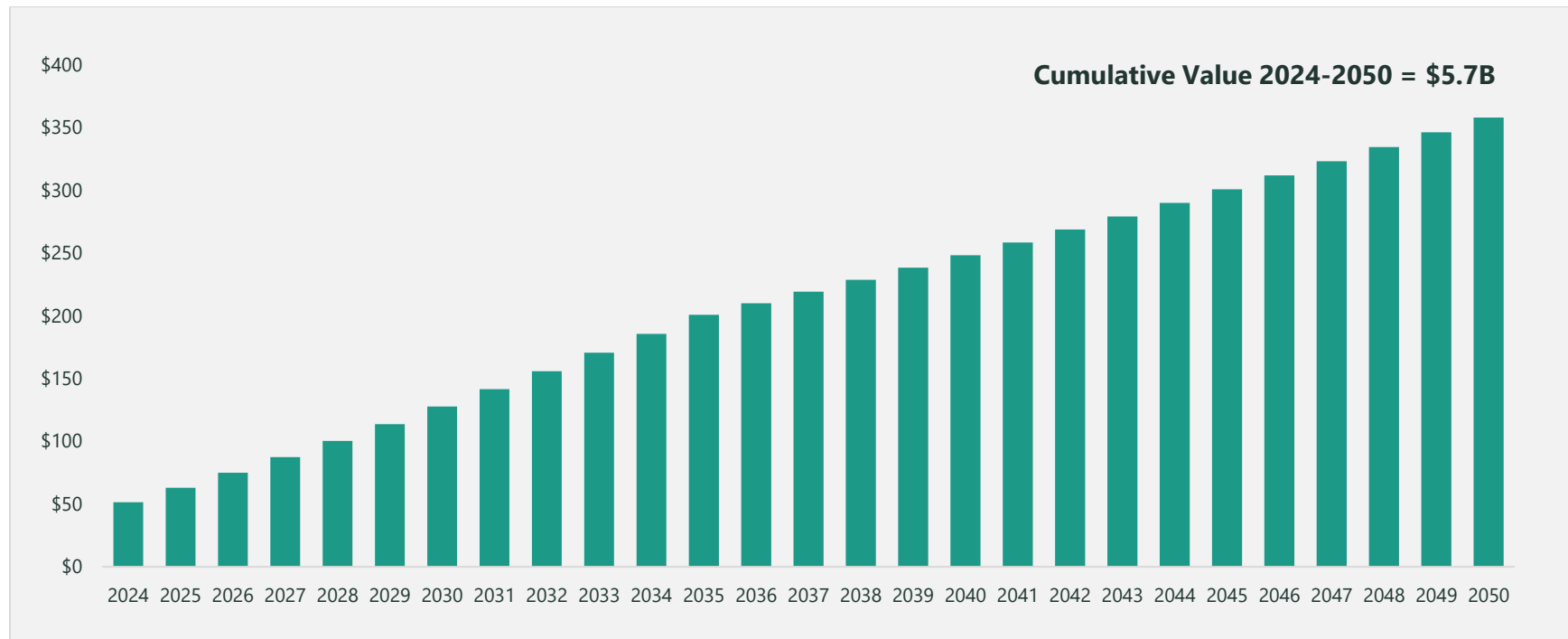
Notes and Sources: Values based on year of GHG emissions (Interagency Working Group, 2021). Emissions reductions from transportation strategies from SCAG Connect SoCal Transportation Activity-Based Model and EMFAC 2021 and non-transportation Strategies (Building & Water Energy Use) SCAG Scenario Planning Model.

Reducing GHG emissions combats climate change and avoids costly damages from climate change, thereby providing a benefit to society. Economists quantify and monetize the benefit to society from reducing GHG emissions and refer to it as the social cost of greenhouse gases (“SC-GHG”). The social cost of carbon, or more broadly, the social cost of GHG is a measure of the economic benefit of mitigating climate change and provides a benchmark against which climate policy can be evaluated (Rennert 2021). A number of studies have estimated the SC-GHG and can vary widely. However, the federal government and California agencies such as CARB and Caltrans rely on the SC-GHG based on the work of the Interagency Working Group on the Social Cost of Greenhouse Gases (“IWG”). Therefore, for our analysis, we adopt the IWG SC-GHG.

The IWG is a group of scientists convened in 2009 by the Council of Economic Advisers and the Office of Management and Budget to develop a common measure of economic damages from GHG emissions and climate change to facilitate transparent policy decisions by federal and state agencies. The most recent IWG interim estimate of the SC-GHG is \$51 per ton of GHG (2020\$), which translates to \$56 in 2023 dollars. This measure of SC-GHG is an extreme lower bound on the social cost of GHG emissions. For example, in 2022, the U.S. Environmental Protection Agency proposed an SC-GHG at \$190 per ton (EPA 2022), and the current price of carbon on the European Union’s carbon market is approximately \$94 per ton (Trading Economics 2023). The SC-GHG estimates include impacts on energy demand (e.g., cooling and heating), changes in agricultural and forestry production, property lost to sea level rise, coastal storms, heat-related illness and some diseases, changes in freshwater availability and general catastrophic and ecosystem impacts (Cost of Carbon). However, some damages are difficult to quantify and are omitted from the SC-GHG models, including impacts from increased wildfire (e.g., lost forest acreage, increased respiratory illness), species extinction, decreased labor productivity (e.g., from extreme heat and weather), impact on infrastructure, and increased interregional conflict (IWG 2022).

The two above-mentioned sources of GHG reduction linked to Plan implementation are estimated to emissions by 67 MMT between 2024 and 2050. Using the SC-GHG, the economic value of the co-benefits of GHG emission reductions from the Plan can be conservatively estimated at a minimum of \$5.7 billion (2023 USD). The annual values of GHG emissions reduction under the 2024 Plan are shown in Figure 2.

Figure 2. Annual Global Values of Reduced GHG Emissions under the Plan, 2025-2050 (Millions \$2023)



Notes and Sources: Values based on year of GHG emissions (Interagency Working Group, 2021). Emissions reductions from transportation strategies from SCAG Connect SoCal Transportation Activity-Based Model and EMFAC 2021) and non-transportation Strategies (Building & Water Energy Use) SCAG Scenario Planning Model. .

In addition to the co-benefit of reduced GHG emissions, vibrant, multi-modal places foster increased physical activity and contribute to reducing criteria air pollutants (e.g., ozone, particulates). These benefits will sometimes not be reflected completely in home prices or local business activity (the measures of local economic benefits described above), but they are real, nonetheless. For example, a large body of literature discusses the positive public health effects of active transportation infrastructure investment (Boarnet, Greenwald, and McMillan 2008). Moreover, the travel, community, and environmental benefits of additional Plan strategies like 15-minute communities and priority development areas can also be considered co-benefits, some of which are reflected in part or in full through this GHG reduction quantification (see Land Use and Communities Technical Report). The estimated SC-GHG values we report provide a lower bound on the economic value of Plan co-benefits such as these. Future modeling efforts can focus on developing a more comprehensive measure of the economic value of Plan co-benefits.

4.4 TOTAL IMPACTS

Connect SoCal 2024 is a long-term vision for the region's future, with a focus on transportation infrastructure, inclusive economic development, economic and climate resilience, housing, and sustainability planning all rolled into one. This strategy will help Southern California address some of the region's pressing problems, including unemployment, congestion, out migration, long-term growth trends, uneven development, disinvested communities, and air quality.

A fundamental part of this strategy is understanding the relationship between infrastructure investment and the competitiveness, costs, and transportation efficiency of the Southern California economy. When efficient road and transit systems knit together a large region, economic life can be smoother and faster for residents, neighborhoods, communities, and the region:

- Workers spend more leisure time with families and friends or more productive time at work, and less time commuting.
- Companies have access to a wider radius of potential employees and customers.
- Importers, exporters, warehouses, and producers see their supplies and products moving with the speed and reliability their schedules require.
- Residents and tourists have easier access to entertainment, attractions, and cultural hotspots.
- Lower congestion means lower levels of pollution and the costs they impose on our region.

Whether measured in dollars, time, or health, beneficial impacts to workers, families, and companies located in the region are clear and measurable. Given these additional economic benefits, more advanced economic impact models such as REMI TranSight are used to estimate the impacts on economic activity and job creation.

The total jobs impact from the Connect SoCal 2024 investment is summarized in Table 4, with thousands of new jobs (annual average) and GDP growth (in 2023 \$billions) resulting from the Plan in five-year periods and an annual average for FY2025–2050 shown. The Plan would create an average of 465,000 jobs a year.

Table 4. Summary of Economic Impacts of Connect SoCal 2024 on the SCAG Region

Economic Impacts of Plan	Average Annual Growth					Planning Period Average
	FY2025 - FY2029	FY2030 - FY2034	FY2035 - FY2039	FY2040 - FY2044	FY2045 - FY2050	
Total Job Growth from Plan <i>Thousands of Jobs</i>	364.9	392.1	506.6	523.5	515.2	464.5
Total GDP Growth from Plan <i>Billions, 2023 Dollars</i>	26.9	33.9	47.4	54.5	61.5	46.1

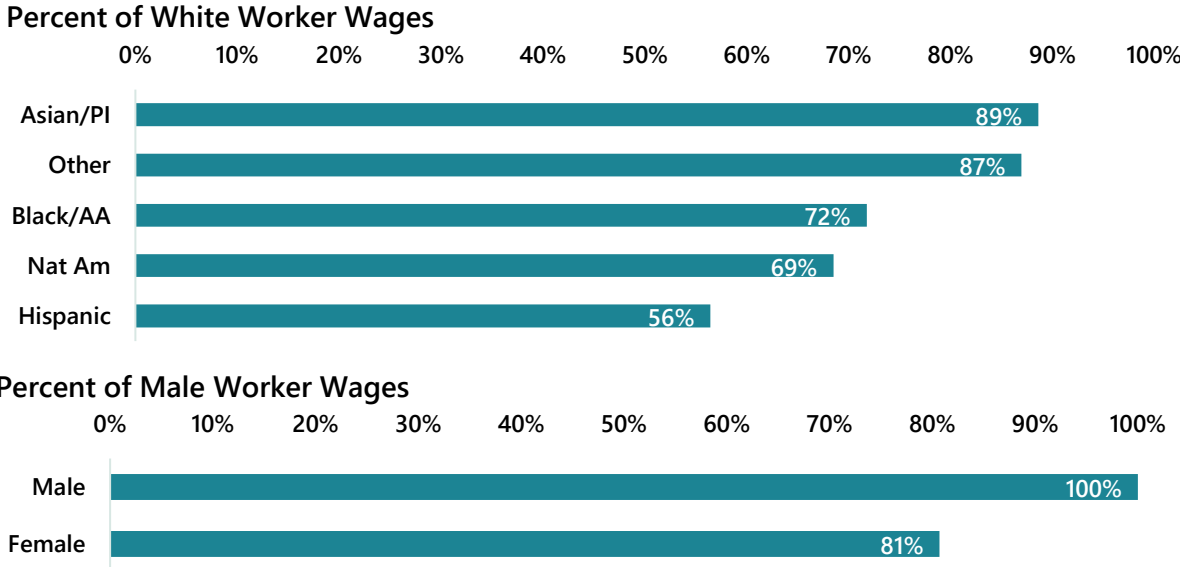
Source: Tables 4, 5, above.

5. EQUITY AMPLIFIES TRANSPORTATION INVESTMENT BENEFITS

The projected economic impacts described in Sections 3. and 4 of this report assume that the region’s economic structure is stable and looks much like today’s economy. However, the SCAG Regional Council adopted the Inclusive Economic Recovery Strategy in July 2021 and, with a grant from the State of California, started implementing strategies for equitable and inclusive economic growth (see Chapter 3 of the Connect SoCal Plan report)—specifically focusing on racial disparities. The SCAG Region economy has the potential to be more equitable and inclusive in the future. By eliminating racial and gender wage gaps in the region, the region’s GDP per capita could increase as much as 17 percent. Placed in the context of Connect SoCal 2024 transportation investment, this value to the region’s economy could be amplified by as much as 17 percent.

The most pervasive manifestation of an inequitable and exclusive job market is the unexplained wage gap faced by people of color and women. Figure 3 shows that, on average, women earned 81 percent of what men earned in the SCAG Region in 2021. Non-Hispanic Black workers earned 72 percent, and Hispanic workers earned 56 percent of non-Hispanic White workers’ earnings in the SCAG Region in 2021. Certainly, differences in education, occupational preferences, and other factors unique to individuals can explain wage differences across individuals. FIGURE 3 does not control for these factors. However, in a world with equitable treatment of workers, and equitable access to education and occupational opportunities, we should expect that, on average, workers of all races and genders have the same opportunities. Therefore, observation of large differences in *average* wages, even without controlling for factors that explain individual differences in wages, is informative as a starting point for this analysis. Moreover, these observed average wage inequities impact the economy in several ways.

Figure 3. Wage Gap by Non-Hispanic Race, Hispanic, and Gender in the SCAG Region, 2021



Notes: Based on 2021 American Community Survey 1-Year PUMS Estimates. Includes wage and salary workers in the labor force, age 25-64. Excludes observations with labor income below 1st and above 99th percentiles. All races are non-Hispanic. Hispanic includes any race identifying as Hispanic or Latino.

Persistent wage gaps discourage workers and reduce labor force participation, which decreases the labor supply and increases the cost of labor. Moreover, a smaller, shallower pool of workers reduces innovation and economic growth (Bell and Chetty, 2019). Racial and gender wage inequity reduces consumption because lower-paid workers have less disposable income and spend less on goods and services. As a result, economic growth slows and lower earnings and spending result in lower tax revenues for local jurisdictions. Finally, persistent inequity can contribute to social unrest, which negatively impacts the quality of life in the region and the perception of the region. For a broader discussion and analysis of equity in the region, see the Equity Analysis Technical Report.

A group of researchers at the Federal Reserve Bank of San Francisco developed a method for quantifying the economy-wide impacts of inequitable growth in a recent paper (Buckman et al 2022). Their method is straightforward, and we apply it to the SCAG Region using 2021 American Community Survey data for the six SCAG counties. The Buckman et al approach for estimating the economy-wide benefits from greater equity in the labor market starts by computing the average wage income for each racial/ethnic and gender group and the contribution of each group's income to the region's GDP. The analysis focuses on prime-age (25-64) civilian workers in the labor force, regardless of employment status. Each group's contribution to GDP is summed. We compute this in the first four columns of Table 5.

The next step is to propose a counterfactual—an alternate reality, so to speak—where we estimate the wage income contribution as if people of color and women were treated equally to White men in the labor market. One way to approximate this counterfactual is to assume that racial minorities and women, on average, earn the same wages as White men. In other words, we eliminate the racial wage gap in our counterfactual. As before, we compute each group's contribution to GDP and sum across the groups. The potential gain from eliminating the wage gap is the difference between the actual contribution to GDP and the counterfactual contribution to GDP, shown in the last four columns in Table 5.

Based on this analysis, we estimate that the potential incremental income in the SCAG Region from increased equity is nearly \$234 billion annually or approximately 17 percent of the SCAG Region's GDP in 2021. For example, assuming that this gain in GDP is equally distributed across industries, we can infer the economic growth from Connect SoCal 2024 transportation investments we computed in Section 3. The GDP gains discussed in the previous section could be 17 percent higher in a labor market where the racial and gender wage gaps are eliminated.

Table 5. Incremental Gains from Equity

Group	Group Share of Sample	Actual in SCAG Region, 2021		Counterfactual: Full Equity			
		Group Average Annual Labor Income	Total Earnings Contribution to GDP (Billions 2022\$)	Group Average Annual Labor Income	Total Earnings Contribution to GDP (Billions 2022\$)	Incremental GDP Gains from Equity (Billions 2022\$)	Equity Gains as a Percent of SCAG GDP
White Men	16.2%	97,127	111.17	97,127	111.17		
White Women	13.1%	71,057	65.95	97,127	90.15		
Black Men	2.6%	65,764	12.01	97,127	17.74		
Black Women	2.7%	59,593	11.48	97,127	18.72		
Hispanic Men	26.8%	51,777	97.94	97,127	183.72		
Hispanic Women	20.4%	41,377	59.71	97,127	140.17		
Native Am Men	0.1%	62,092	0.33	97,127	0.52		
Native Am Women	0.1%	57,051	0.22	97,127	0.37		
Asian Men	7.4%	81,677	42.71	97,127	50.79		
Asian Women	7.4%	64,359	33.62	97,127	50.73		
Other Men	1.7%	84,471	9.88	97,127	11.35		
Other Women	1.6%	65,901	7.40	97,127	10.90		
Total			\$452.41		\$686.33	\$233.91	16.9%

Notes: Based on data from the 2021 American Community Survey PUMS 1-Year Estimates. Includes wage and salary workers in the labor force aged 25-64. Excludes observations with labor income below 1st and above 99th percentiles. All races are non-Hispanic. Hispanic includes any race identifying as Hispanic. SCAG Region GDP estimated at \$1.4 trillion in 2021 (REMI). Numbers might not sum to total due to rounding.

6. ADEQUATE HOUSING SUPPLY ESSENTIAL FOR REALIZING PLAN BENEFITS

Realizing the economic promises and potential from Connect SoCal 2024 necessitates an adequate and affordable housing supply. This economic analysis and the Plan’s population, housing and employment projections are guided by SCAG’s Demographic Panel of Experts. Under this guidance, SCAG developed three preliminary scenarios of population, household, and employment from 2019-2050 as part of developing the Connect SoCal 2024 Regional Growth Forecast:

- Low: *Secular stagnation*
- Regional Baseline: *Slower growth, steady improvement*
- High: *Robust and equitable future growth supported by policy and technology*

The Plan projections and ABM output are based on the baseline scenario, which assumes that household formation rates continue their nascent rebound and return to the higher levels seen in the mid-2000s by the early 2030s. Following the expert panel’s advice, the principal difference of the Low Scenario is that the level of housing production in the region does not facilitate this increase. Full details and input assumptions of the three scenarios can be found in Section 2.3 and TABLE 9 of the Demographics and Growth Forecast Technical Report.

Since the principal difference between the low and baseline scenarios is whether a combination of market conditions and supportive policies result in supplying sufficient housing, the difference between the employment outcomes in these scenarios can be seen as an indicator of the economic impact of sufficient housing supply. Under the locally-reviewed baseline projection, in which we assume sufficient housing, employment in 2050 is 10.2 million (see TABLE 8). Under the Low Scenario, with inadequate housing development, we project 2050 employment of 9.5 million. Therefore, the estimated impact of building sufficient housing is 0.7 million jobs in 2050, or 7.4 percent gain in jobs from meeting housing needs.

Table 6. Employment Forecast by Housing Assumption (Millions)

Scenario	Employment
Regional Baseline, post-LDX Scenario	10.2
Low Scenario: Secular Stagnation	9.5
Difference (Mid - Low)	0.7
Percent Difference Relative to Low Scenario	7.4%

Source: *Demographics and Growth Forecast Technical Report (SCAG 2024)*.

In terms of the outcomes described in our economic impact analysis, this suggests that failure to meet housing goals could have a significant impact on the region’s ability to fully enjoy the economic gains from Connect SoCal 2024 polices and strategies.

7. DISCUSSION

This economic impact analysis shows that Connect SoCal 2024 transportation investments will result in job growth from building, operating, and maintaining the regional transportation infrastructure projects, averaging over 279,000 jobs per year. Taking into account the increases in economic competitiveness, efficiency, and amenities from the completion of the projects and operations, job growth will increase to 465,000 jobs per year on average. The analysis in this technical report finds that under the Plan, regional GDP can grow an average of \$46.1 billion per year (in 2023 constant dollars).

As a proxy for the economic value of the co-benefits of infrastructure investment and a broader suite of Plan implementation strategies, the analysis in this technical report also computed the economic value of co-benefits of the Plan's GHG emissions. By reducing GHG emissions over 2024-2050, the Plan can realize \$5.7 billion in cumulative benefits. This should be considered a lower bound as it does not include extreme situations. The Plan's emphasis on resilience may foster these economic benefits. Reduced GHG emissions and transportation efficiency gains will bolster the region's economic resilience, particularly for climate-related risks.

The SCAG Region spans over 36,000 square miles, and the friction of distance means employers in one sub-area of the region cannot easily access workers living in another. A more efficient transportation system, with increased mass transit systems, will create a more efficient and competitive labor market and add economic activity and jobs to the economy. Connect SoCal 2024 outlines a transportation infrastructure investment strategy that will beneficially impact Southern California, the state, and the nation in terms of economic development, job creation and economic growth, and overall business and economic competitive advantage in the global economy in terms of job creation and economic growth throughout the SCAG Region. The Plan's emphasis on equity and the pro-housing assumptions embedded in the Regional Growth Forecast offers two more windows on the potential for jobs supported by housing creation and the economic value of eliminating racial and gender wage gaps.

More broadly, the Plan's vision is of a healthy, prosperous, accessible, and connected region for a more resilient and equitable future. While Plan implementation strategies beyond transportation investments have a wide range of budgets, timelines, and partners, these can also have economic benefits not captured in the economic impact analysis.

APPENDIX

1. Computation of the Value of GHG Emissions

8. REFERENCES

Barrero, J.M., Bloom, N., and Davis, S.J. (2023). The Evolution of Working from Home. Working Paper, WFH Research, <https://wfhrefsearch.com/wp-content/uploads/2023/07/SIEPR1.pdf>.

Bell, A., Chetty, R., Jaravel, X., Petkova, N. and Van Reenen, J. (2019). Who becomes an inventor in America? The importance of exposure to innovation. *The Quarterly Journal of Economics*, 134(2), pp.647-713.

Boarnet, Marlon G., Michael Greenwald, and Tracy McMillan (2008). Walking, Urban Design, and Health: Toward a Cost-Benefit Analysis Framework. *Journal of Planning Education and Research*, 27: 341-358.

Buckman, S. R., Choi, L. Y., Daly, M. C., & Seitelman, L. M. (2022). The economic gains from equity. *Brookings Papers on Economic Activity*, 2021(2), 71-139.

Buckman, S. R., Choi, L. Y., Daly, M. C., & Seitelman, L. M. (2022). The economic gains from equity. *Brookings Papers on Economic Activity*, 2021(2), 71-139.

Fang, K., & Volker, J. (2017). Cutting greenhouse gas emissions is only the beginning: a literature review of the co-benefits of reducing vehicle miles traveled.

Hymel, Kent (2009). Does traffic congestion reduce employment growth? *Journal of Urban Economics*, 65(2): 127-135.

Interagency Working Group on the Social Cost of Greenhouse Gasses. Technical Support Document: Social Cost of Carbon, Methane and Nitrous Oxide Interim Estimates under Executive Order 13990. February 2021 Available from https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf.

Kwan, S. C., & Hashim, J. H. (2016). A review on co-benefits of mass public transportation in climate change mitigation. *Sustainable cities and society*, 22, 11-18.

Laube, M. M., Rainville, L., & Lyons, W. M. (2014). *A multi-modal approach to economic development in the metropolitan area transportation planning process* (No. DOT-VNTSC-FHWA-14-09; FHWA-HEP-14-047). John A. Volpe National Transportation Systems Center (US).

Martinich, Jeremy, and Allison Crimmins (2019). Climate damages and adaptation potential across diverse sectors of the United States. *Nature Climate Change*, 9(5), 397-404.

REMI (2023). TranSight v5.1: Model Documentation. Regional Economic Models, Inc., Amherst, MA.

Southern California Association of Governments (2024), Transportation Finance Technical Report, Connect SoCal 2024.

Trading Economics. EU Carbon Permits. <https://tradingeconomics.com/commodity/carbon> (Accessed on 9/05/2023).

U.S. Environmental Protection Agency. Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances. September 2022. Available from https://www.epa.gov/system/files/documents/2022-11/epa_scghg_report_draft_0.pdf.

APPENDIX 1: COMPUTATION OF THE VALUE OF GHG EMISSIONS

This technical appendix explains the computation and assumptions for computing the value of reducing GHG emissions in the SCAG Region, presented in Figure 1 and Figure 2.

Computing the value of reduced GHG emissions starts by computing certain reduced GHG emissions associated with the Plan. Plan GHG emissions are computed for transportation sources based on the SCAG's ABM model for a scenario in which the Plan is not implemented ("trend") and a scenario in which the Plan is implemented. The difference between these two are the reduced GHG emissions from the Plan's transportation strategies. These are shown in TABLE A1. The model outputs GHG emissions in thousands of tons per day. Following modeling convention, we assume 347 days per year to convert daily emissions to annual emissions. We then convert thousands of tons to millions of metric tons (MMT). The results are provided for 2019, 2035, and 2050. We use linear interpolation to compute the intermediate years of emissions. We estimate total transportation related GHG emissions reduction of 51.2 MMT.

Table A1. GHG Emissions Reductions from Transportation Strategies

Year of Emissions	Light & Medium Duty Vehicle GHG Emissions, Thousand Tons per Day			Annual GHG Emissions Reduction (MMT)
	Trend	Plan	Reduction	
2019	200.9	200.9	0.00	0.0
2020	197.7	197.3	0.37	0.1
2021	194.5	193.8	0.74	0.3
2022	191.4	190.3	1.10	0.4
2023	188.2	186.8	1.47	0.5
2024	185.1	183.3	1.84	0.6
2025	181.9	179.7	2.21	0.8
2026	178.8	176.2	2.58	0.9
2027	175.6	172.7	2.95	1.0
2028	172.5	169.2	3.31	1.1
2029	169.3	165.6	3.68	1.3
2030	166.2	162.1	4.05	1.4
2031	163.0	158.6	4.42	1.5
2032	159.9	155.1	4.79	1.7
2033	156.7	151.6	5.16	1.8
2034	153.6	148.0	5.52	1.9
2035	150.4	144.5	5.89	2.0
2036	150.2	144.2	6.00	2.1
2037	150.0	143.9	6.10	2.1
2038	149.7	143.5	6.21	2.2
2039	149.5	143.2	6.32	2.2
2040	149.3	142.9	6.42	2.2
2041	149.1	142.5	6.53	2.3
2042	148.9	142.2	6.64	2.3
2043	148.6	141.9	6.74	2.3
2044	148.4	141.6	6.85	2.4
2045	148.2	141.2	6.95	2.4

Year of Emissions	Light & Medium Duty Vehicle GHG Emissions, Thousand Tons per Day			Annual GHG Emissions Reduction (MMT)
	Trend	Plan	Reduction	
2046	<i>148.0</i>	<i>140.9</i>	7.06	2.5
2047	<i>147.7</i>	<i>140.6</i>	7.17	2.5
2048	<i>147.5</i>	<i>140.2</i>	7.27	2.5
2049	<i>147.3</i>	<i>139.9</i>	7.38	2.6
2050	<i>147.1</i>	<i>139.6</i>	7.49	2.6
Total	4,242.5	4,095.0	147.5	51.2

Notes and Sources: Emissions reductions from transportation strategies from SCAG Connect SoCal Transportation Activity-Based Model and EMFAC 2021 for 2019, 2035 and 2050. Emissions in italics are linearly interpolated between 2020 and 2034 and from 2036 and 2049. Numbers might not sum to total due to rounding.

The Plan’s non-transportation strategies reduce additional GHG emissions SPM generates additional GHG emissions reductions from the Plan’s forecasted development patterns and additional implementation strategies on building energy use and water energy use. As for the ABM model, we take the trend emissions (i.e., no plan) and the Plan GHG emissions and compute the reductions as the difference, as shown in TABLE A2. Based on non-transportation sources, the SPM model estimates an additional 15.7 MMT of GHG reductions.

Table A2: GHG Emissions Reductions from Non-Transportation Strategies (Building and Water Energy Use)

Year of Emissions	GHG Emissions in MMT Per Year (SCAG SPM)		
	Trend	Plan	Reduction
2019	67.5	67.5	
2020	66.8	66.8	0.032
2021	66.1	66.1	0.065
2022	65.4	65.3	0.097
2023	64.7	64.6	0.129
2024	64.0	63.9	0.161
2025	63.4	63.2	0.194
2026	62.7	62.4	0.226
2027	62.0	61.7	0.258
2028	61.3	61.0	0.290
2029	60.6	60.3	0.323
2030	59.9	59.6	0.355
2031	59.2	58.8	0.387
2032	58.5	58.1	0.419
2033	57.8	57.4	0.452
2034	57.1	56.7	0.484
2035	56.5	55.9	0.516
2036	55.8	55.2	0.548
2037	55.1	54.5	0.581

Year of Emissions	GHG Emissions in MMT Per Year (SCAG SPM)		
	Trend	Plan	Reduction
2038	54.4	53.8	0.613
2039	53.7	53.0	0.645
2040	53.0	52.3	0.677
2041	52.3	51.6	0.710
2042	51.6	50.9	0.742
2043	50.9	50.2	0.774
2044	50.2	49.4	0.806
2045	49.6	48.7	0.839
2046	48.9	48.0	0.871
2047	48.2	47.3	0.903
2048	47.5	46.5	0.935
2049	46.8	45.8	0.968
2050	46.1	45.1	1.000
Total			15.677

Notes and Sources: Emissions reductions from SCAG Scenario Planning Model for 2019 and 2050. Emissions in italics are linearly interpolated between 2019 and 2050. Numbers might not sum to total due to rounding.

The next step is to compute the total reduction in GHG emissions and assign a value to the GHG emissions reduction induced by the Plan. TABLE A3 shows this calculation. As explained in the main text, we adopt the Interagency Working Group’s social cost of carbon (SC-GHG) to value the reduced GHG emissions. The value reported by IWG inflated to 2023 dollars, is shown in column (a) in TABLE A3. The SC-GHG is computed for the year in which emissions are emitted.

The total Trend and Plan GHG emissions from ABM and SPM are shown in columns (b) and (c). The total reduction in GHG emissions in MMT is shown in column (d). The value of reduced GHG emissions is computed as the SC-GHG per ton times the tons of carbon reduced in each year. The total benefit from reduced GHG emissions is the sum of the value in each year, or \$5.7 billion (constant 2023 dollars).

Table A3. Value of Total Reduction of Greenhouse Gas Emissions Associated with the 2024 Connect SoCal

Year of GHG Emissions	Social Cost of GHG per Ton (2023\$)	SCAG Region GHG Emissions (MMT)		SCAG Region Reduction in GHG (MMT)	Value of Reduced GHG Emissions (Millions 2023\$)
		Trend	Plan		
	(a)	(b)	(c)	(d) = (b)-(c)	(e) =(d)x(a)
2024	\$64	128.3	127.5	0.8	\$51.50
2025	\$66	126.5	125.5	1.0	\$62.93
2026	\$67	124.7	123.6	1.1	\$74.94
2027	\$68	122.9	121.6	1.3	\$87.38
2028	\$70	121.1	119.7	1.4	\$100.26
2029	\$71	119.4	117.8	1.6	\$113.57
2030	\$73	117.6	115.8	1.8	\$127.73
2031	\$74	115.8	113.9	1.9	\$141.59
2032	\$75	114.0	111.9	2.1	\$155.82
2033	\$76	112.2	110.0	2.2	\$170.43

Year of GHG Emissions	Social Cost of GHG per Ton (2023\$)	SCAG Region GHG Emissions (MMT)		SCAG Region Reduction in GHG (MMT)	Value of Reduced GHG Emissions (Millions 2023\$)
		Trend	Plan		
2034	\$77	110.4	108.0	2.4	\$185.41
2035	\$78	108.6	106.1	2.6	\$200.77
2036	\$80	107.9	105.3	2.6	\$209.88
2037	\$81	107.1	104.4	2.7	\$219.19
2038	\$83	106.3	103.6	2.8	\$228.70
2039	\$84	105.6	102.7	2.8	\$238.39
2040	\$85	104.8	101.9	2.9	\$248.28
2041	\$87	104.0	101.1	3.0	\$258.37
2042	\$88	103.3	100.2	3.0	\$268.65
2043	\$90	102.5	99.4	3.1	\$279.13
2044	\$91	101.7	98.6	3.2	\$289.79
2045	\$92	101.0	97.7	3.3	\$300.66
2046	\$94	100.2	96.9	3.3	\$311.71
2047	\$95	99.4	96.0	3.4	\$322.97
2048	\$97	98.7	95.2	3.5	\$334.41
2049	\$98	97.9	94.4	3.5	\$346.05
2050	\$99	97.1	93.5	3.6	\$357.88
Total		2,830.9	2,764.8	66.1	\$5,686.38

Notes and Sources: SC-GHG is based on annual values computed by the IWG and adopted by federal agencies. IWG Working Paper (2021). Inflated to 2023 dollars using national CPI. Estimated GHG emissions for baseline/trend and plan from SCAG Connect SoCal Transportation Activity-Based Model and EMFAC 2021 and non-transportation Strategies (Building & Water Energy Use) SCAG Scenario Planning Model. Numbers might not sum to total due to rounding.





Main Office

900 Wilshire Blvd., Ste. 1700
Los Angeles, CA 90017
Tel: (213) 236-1800
www.scag.ca.gov

Regional Offices

Imperial County

1503 N. Imperial Ave., Ste. 104
El Centro, CA 92243
Tel: (213) 236-1967

Orange County

OCTA Building
600 S. Main St., Ste. 1143
Orange, CA 92868
Tel: (213) 236-1904

Riverside County

3403 10th St., Ste. 805
Riverside, CA 92501
Tel: (951) 784-1513

San Bernardino County

1170 W. Third St., Ste. 140
San Bernardino, CA 92410
Tel: (213) 630-1499

Ventura County

4001 Mission Oaks Blvd., Ste. L
Camarillo, CA 93012
Tel: (213) 236-1960