



Active Transportation Benefits

California Department of Transportation

April 2017



Document Information			
Alta Planning + Design 100 Webster Street, Ste 300 Oakland, CA 94607 Ph. (510) 540-5008 Fax. (510) 540-5039 www.altaplanning.com	Prepared by	Kyle James, Celina Chan	
	Project Manager	Hugh Louch	
	Project Title	California State Bicycle and Pedestrian Plan	
	Client	Scott Forsythe	
Document Revision Schedule			
Review of Existing Documents			
Rev.	Description	Date	Reviewed by
v1	Draft report	3/14/2017	Hugh Louch
v2	Final	4/17/2017	Hugh Louch

Table of Contents

1. Introduction	1
Methodology	1
2. Benefits	2
Health Benefits	2
Environmental Benefits	3
Transportation Benefits	4
Total Benefits	5

1. Introduction

This memo contains an analysis of the quantified benefits that might occur as the result of achieving the active transportation targets set in Caltrans Strategic Management Plan. The analysis estimates the number of bicycle and pedestrian trips associated with achieving these targets approximates the corresponding reduction in vehicle trips and vehicle miles travelled (VMT), and assesses the potential health-, environmental-, and transportation-related benefits.

Methodology

The impact analysis uses a standard methodology for calculating health-, environmental-, and transportation-related benefits. All projections are based on American Community Survey (ACS) five-year estimates from the U.S. Census Bureau, which are then extrapolated through the use of various multipliers derived from national studies and quantified in terms of monetary value where appropriate.

The estimated benefits are based on the walking and bicycling goals outlined in the plan. The California State Bicycle and Pedestrian Plan adopted the Caltrans Strategic Management Plan target of doubling walking and tripling bicycling rates. Compared to other states, California was ranked in 2015 as the 8th most bicycle friendly state¹.

Multipliers

Multipliers were developed through an analysis of the relationship between two or more model inputs (such as the number of vehicle-miles reduced) and associated model outputs (such as the cost of road maintenance per every vehicle-mile travelled). The model used for this study uses over 50 multipliers in order to extrapolate daily, monthly, and annual trip rates, trip distance, vehicle trips replaced, emission rates, physical activity rates, and other externalities linked to an increase in bicycling and walking trips and to a decrease in motor vehicle trips. Individual multipliers of note are covered in more detail in the sections that follow.

Limitations

The purpose of this analysis is to enable a more informed policy discussion on whether and how best to invest in a bicycle and pedestrian network in the state of California. Even with extensive primary and secondary research incorporated into the impact analysis model, it is impossible to accurately predict the *exact* impacts of various factors. Accordingly, all estimated benefit values are rounded and should be considered order of magnitude estimates, rather than exact amounts.

2. Benefits

Health Benefits

The implementation of a well-designed, connected bicycle and pedestrian network across California will encourage a shift from energy-intensive modes of transportation such as cars and trucks to active modes of transportation such as bicycling and walking. The impact analysis model evaluates and quantifies the estimated increase in bicycling and walking trips, the estimated increase in hours of physical activity, and the annual savings resulting from reduced healthcare costs. In order to evaluate these health factors, the consultant team analyzed readily-available data inputs.

Health Calculations

The primary inputs into the health component of the impact analysis model come from the American Community Survey five-year estimates of commute trip data from the U.S. Census Bureau. Five-year estimates were chosen because they are the most reliable dataset available from the U.S. Census Bureau between the 10-year censuses and because they allow for analysis at the individual census tract level.²

After extrapolating the commute trip data to recreational trips and to estimate daily, monthly, and annual trip values, the consultant team used a series of multipliers and assumptions to calculate the various health factors. If the state of California achieves the target set out in the Strategic Management Plan, the state could experience 2,181,446,000 more bicycling trips per year and 11,404,949,000 more walking trips than is currently experienced. Using trip distance multipliers derived from the National Household Travel Survey (NHTS) and annual vehicle trip replacement factors derived from a combination of US Census data, NHTS data, and historic Safe Routes to School data, the estimated increase in distance bicycled would be 5,130,456,000 miles per year and the estimated increase in distance walked would be 8,451,172,000 miles per year, resulting in 1,458,712,000 fewer vehicle-miles travelled (VMT) annually.

These annual distance estimates and VMT reduction estimates were used to calculate changes in physical activity rates among residents in California. Implementation of the recommended projects could result in 3,330,103,000 more hours of physical activity per year among California residents than currently occurs. This increase in physical activity means that an additional 25,615,762 residents will be meeting the Centers for Disease Control and Prevention (CDC) minimum number of hours of physical activity per day, which is equal to a jump from approximately 46.9 percent of the physical activity need being met to nearly 100 percent of the physical activity need being met – an increase of 53.1 percent. This growth in the percent of people within the state exercising also equates to a \$618,196,000 reduction in healthcare expenses per year. **Table 1** summarizes the annual health benefits for California.

² “When to use 1-year, 3-year, or 5-year estimates.” *US Census Bureau*. http://www.census.gov/acs/www/guidance_for_data_users/estimates/

Table 1: Annual Health Benefits

	California
Increase in Annual Bicycle Trips	2,181,446,000
Increase in Annual Miles Bicycled	5,130,456,000
Increase in Annual Walk Trips	11,404,949,000
Increase in Annual Miles Walked	8,451,172,000
Increase in Annual Hours of Physical Activity	3,330,103,000
Increase in Number of Residents Meeting CDC Recommended Number of Hours of Physical Activity	25,615,762
Increase in Physical Activity Need Met	53.1%
Annual Healthcare Cost Savings	\$618,169,000

Environmental Benefits

While the causes of physical inactivity and pollution stem from many sources, the implementation of the recommended bicycle and pedestrian projects in California will contribute to a shift from energy-intensive modes of transportation such as cars and trucks to active modes of transportation such as bicycling and walking. The impact analysis model evaluates and quantifies the estimated increase in bicycling and walking trips and the annual savings from reduced vehicle emissions. To evaluate these environmental factors, a number of readily-available data inputs were analyzed.

Environmental Calculations

The primary inputs into the environmental component of the impact analysis model come from five-year estimates of commute trip data from the U.S. Census Bureau. Using the same estimates of VMT reduction calculated in the health benefits analysis, changes in hydrocarbon, particulate matter, nitrous oxides, carbon monoxide, and carbon dioxide were analyzed. In total, the replacement of motor vehicle trips with active transportation trips may result in an estimated 2,373,354,000 fewer pounds of CO₂ emissions per year and 47,335,000 fewer pounds of other vehicle emissions. Based on a review of air emissions studies, each pound of emissions was assigned an equivalent dollar amount based on how much it would cost to clean up the pollutant or the cost equivalent of how much damage the pollutant causes the environment. The total reduction in vehicle emissions is equal to a savings of \$48,824,000 in related environmental damage or clean-up per year. Other potential ecological services associated with the transportation projects and land use changes needed to achieve the Strategic Management Plan target, such as water regulation, carbon sequestration, carbon storage, and waste treatment exist, but the quantifiable value of these services are either negligible or challenging to estimate given the unknown nature of the specific changes being assumed. **Table 2** summarizes the annual environmental benefits for California.

Table 2: Annual Environmental Benefits

	California
CO2 Emission Reduced (lbs)	2,373,354,000
Other Vehicle Emissions Reduced (lbs)	47,335,000
Total Vehicle Emission Costs Reduced	\$48,824,000

Transportation Benefits

The most readily-identifiable benefits of the recommended project list derive from their use as a connection between activity centers and residences. While no money may change hands, real savings can be estimated from the reduction costs associated with congestion, vehicle crashes, road maintenance, and household vehicle operations.

Transportation Calculations

The primary inputs into the health component of the impact analysis model come from five-year estimates of commute trip data from the U.S. Census Bureau.

Using the same calculations for estimated increase in annual bicycle and walk trips and annual VMT reductions used in the health and environmental components, transportation-related cost savings can be calculated. By multiplying the amount of VMT reduced by established multipliers for traffic congestion, vehicle collisions, road maintenance, and vehicle operating costs, monetary values can be assigned to the transportation-related benefits. In total, an annual cost savings of \$1,546,237,000 is estimated for the state. **Table 3** summarizes the annual transportation benefits for California.

Table 3: Annual Transportation Benefits

	California
Reduced Traffic Congestion Costs	\$175,045,000
Reduced Vehicle Collision Costs	\$320,917,000
Reduce Road Maintenance costs	\$218,808,000
Household Vehicle Cost Savings	\$831,467,000
Total Vehicle Cost Savings	\$1,546,237,000

Total Benefits

If we achieve the target set in the Caltrans Strategic Management Plan, the state could experience a total of \$5,409,064,000 in health-, environmental-, and transportation-related benefits per year. This is an addition of \$2,213,257,000 in total benefits compared to the 2010-2012 estimate of \$3,195,807,000 that result from current expected levels of bicycling and walking in California. **Table 4** summarizes the calculated benefits.

Table 4: Total Annual Benefits

	California
Annual Health Benefits	\$618,196,000
Annual Environmental Benefits	\$48,824,000
Annual Transportation Benefits	\$1,546,237,000
Total Annual Benefits	\$2,213,257,000

Achieving these benefits will likely require significant investments in new facilities and programs, as well as changes to land use and development patterns. Toward an Active California identifies strategies to help achieve this goal, but achieving these benefits will take significant effort by Caltrans and many partner agencies and the private sector. Land use changes, in particular, could have many other benefits, such as changes to the length of trips even if conducted by automobile, that are not captured in this analysis.