T-22-B. Implement Electric Bikeshare Program

GHG Mitigation Potential

0.06%

Up to 0.06% of GHG emissions vehicle travel in the plan/community

Co-Benefits (icon key on pg. 34)

Climate Resilience

Bikeshare programs can incentivize more bicycle use and decrease vehicle use, which have health benefits and can thus improve community resilience. This can also improve connectivity between residents and resources that may be needed in an extreme weather event. However, they may decrease resilience if they are the only option available during a power outage.

Health and Equity Considerations

Provide inclusive mechanisms so people without bank accounts, credit cards, or smart phones can access the system.

Measure Description

This measure will establish an electric bikeshare program. Electric bikeshare programs provide users with on-demand access to electric pedal assist bikes for short-term rentals. This encourages a mode shift from vehicles to electric bicycles, displacing VMT and reducing GHG emissions. Variations of this measure are described in Measure T-22-A, *Implement Pedal (Non-Electric) Bikeshare Program*, and Measure T-22-C, *Implement Scootershare Program*.

Subsector

Neighborhood Design

Locational Context

Urban, suburban

Scale of Application

Plan/Community

Implementation Requirements

The GHG mitigation potential is based, in part, on literature analyzing docked (i.e., station-based) bikeshare programs. This measure should be applied with caution if using dockless (free-floating) bikeshare.

Cost Considerations

The costs incurred by the service manager (e.g., municipality or bikeshare company) may include the capital costs for purchasing a bicycle fleet; installing accessible and secure charging stations; storing, maintaining, and replacing the fleet; and marketing and administration. Some of these costs may be offset by income generated through program use. Program participants will benefit from the cost savings from access to cheaper transportation alternatives (compared to private vehicles, private bicycles, or use of ride-hailing services). The local municipality may achieve cost savings through a reduction of cars on the road leading to lower infrastructure and roadway maintenance costs.

Expanded Mitigation Options

Best practice is to discount electric bikeshare membership and dedicate electric bikeshare parking to encourage use of the service. Consider also including space on the vehicle to store personal items while traveling, such as a basket.

GHG Reduction Formula

The quantification methodology does not account for indirect GHG emissions from electricity used to charge the bicycles or direct GHG emissions from vehicle travel of program employees picking up and dropping off bikes.

$$A = -1 \times \frac{(C - B) \times D \times E \times F}{G \times H}$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from vehicle travel in plan/community	0–0.06	%	calculated
User Inputs				
B	Percent of residences in plan/community with access to electric bikeshare system without measure	0–100	%	user input
C	Percent of residences in plan/community with access to electric bikeshare system with measure	0–100	%	user input
Constants, Assumptions, and Available Defaults				
D	Daily electric bikeshare trips per person	0.021	trips per day per person	MTC 2017
E	Vehicle to electric bikeshare substitution rate	35	percent	Fitch et al. 2021
F	Electric bikeshare average one-way trip length	2.1	miles per trip	Fitch et al. 2021
G	Daily vehicle trips per person	2.7	trips per day per person	FHWA 2018
H	Regional average one-way vehicle trip length	Table T-10.1	miles per trip	FHWA 2017

Further explanation of key variables:

- (B and C) – Access to electric bikesharing is measured as the percent of residences in the plan/community within 0.25-mile of an electric bikeshare station. For dockless bikes, assume that all residences within 0.25 mile of the designated dockless service area would have access.
- (D) – An analysis of bike share service areas in the San Francisco Bay Area estimated that in locations with access to bikesharing, there were between 21 and 25 bikeshare trips per day per 1,000 residents (MTC 2017). To be conservative, the low end of this range is cited. Conventional bikeshare trip rate data was used due to lack of specific data for electric bikeshare.
- (E) – A study of dockless electric bike share in Sacramento found that the substitution rate of vehicles trips by electric bikeshare trips was 35 percent (Fitch et al. 2021).

- (F) – A study of dockless electric bike share in Sacramento found that the average one-way bikeshare trip was 2.1 miles (Fitch et al. 2021).
- (G) – A summary report of the 2017 National Household Travel Survey data found that the average person in the U.S. takes 2.7 vehicle trips per day (FHWA 2018).
- (H) – Ideally, the user will calculate auto trip length for a plan/community at a scale no larger than a census tract. Potential data sources include the U.S. Census, California Household Travel Survey (preferred), or local survey efforts. If the user is not able to provide a plan-specific value using one of these data sources, they have the option to input the existing regional average one-way auto trip length for one of the six most populated CBSAs in California, as presented in Table T-10.1 in Appendix C (FHWA 2017). Trip lengths are likely to be longer for areas not covered by the listed CBSAs, which represent the denser areas of the state.

GHG Calculation Caps or Maximums

Measure Maximum

(A_{max}) For projects that use default CBSA data from Table T-10.1, the maximum percent reduction in GHG emissions (A) is 0.06 percent. This maximum scenario is presented in the below example quantification.

Subsector Maximum

($\sum A_{max_{T\text{-}18 \text{ through } T\text{-}22\text{-}C}} \leq 10\%$) This measure is in the Neighborhood Design subsector. This subcategory includes Measures T-18 through T-22-C. The VMT reduction from the combined implementation of all measures within this subsector is capped at 10 percent.

Example GHG Reduction Quantification

The user reduces plan/community VMT by deploying electric bikesharing throughout the area. In this example, the project is in the Los Angeles-Long Beach-Anaheim CBSA, and the one-way vehicle trip length would be 9.72 miles (H). Assuming 100 percent of residents in the plan/community would have bikeshare access (C) where there was no existing access (B), the user would reduce GHG emissions from plan/community VMT by 0.06 percent.

$$A = -1 \times \frac{(100\% - 0\%) \times 0.021 \frac{\text{trips}}{\text{day}\cdot\text{person}} \times 35\% \times 2.1 \frac{\text{miles}}{\text{trip}}}{2.7 \frac{\text{trips}}{\text{day}\cdot\text{person}} \times 9.72 \frac{\text{miles}}{\text{trip}}} = -0.06\%$$

Quantified Co-Benefits

Improved Local Air Quality

The percent reduction in GHG emissions (A) would be the same as the percent reduction in NO_X, CO, NO_2, SO_2, and PM. Reductions in ROG emissions can be calculated by multiplying the percent reduction in GHG emissions (A) by an adjustment factor of 87 percent. See *Adjusting VMT Reductions to Emission Reductions* above for further discussion.

Energy and Fuel Savings

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in GHG emissions (A). This quantification methodology does not account for the increase in electricity used to charge the vehicles or the fuel consumption from vehicle travel of program employees picking up and dropping off bikes.

VMT Reductions

The percent reduction in VMT would be the same as the percent reduction in GHG emissions (A). This quantification methodology does not account for the miles traveled from vehicle travel of program employees picking up and dropping off bikes.

Sources

- Federal Highway Administration (FHWA). 2017. *National Household Travel Survey–2017 Table Designer*. Travel Day PT by TRPTRANS by HH_CBSA. Available: https://nhts.ornl.gov/. Accessed: January 2021.
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- Fitch, D., H. Mohiuddin, and S. Handy. 2021. *Examining the Effects of the Sacramento Dockless E-Bike Share on Bicycling and Driving*. MDPI: Sustainability. January. Available: https://www.mdpi.com/2071-1050/13/1/368. Accessed: March 2021.
- Metropolitan Transportation Commission (MTC). 2017. *Plan Bay Area 2040 Final Supplemental Report–Travel Modeling Report*. July. Available: http://2040.planbayarea.org/files/2020-02/Travel_Modeling_PBA2040_Supplemental%20Report_7-2017.pdf. Accessed: January 2021.