T-17. Improve Street Connectivity

GHG Mitigation Potential

30%

Up to 30.0% of GHG emissions from vehicle travel in the plan/community

Co-Benefits (icon key on pg. 34)

Climate Resilience

Improving street connectivity could increase route redundancy, allowing faster and more efficient travel during extreme weather events, evacuations, or for emergency vehicles requiring access to hazard sites.

Health and Equity Considerations

Multiple active modes routing options allows vulnerable road users to choose based on perceived safety, comfort, speed, and other factors.

Measure Description

This measure accounts for the VMT reduction achieved by a project that is designed with a higher density of vehicle intersections compared to the average intersection density in the U.S. Increased vehicle intersection density is a proxy for street connectivity improvements, which help to facilitate a greater number of shorter trips and thus a reduction in GHG emissions.

Subsector

Land Use

Locational Context

Urban, suburban

Scale of Application

Plan/Community

Implementation Requirements

Projects that increase intersection density would be building a new street network in a subdivision or retrofitting an existing street network to improve connectivity (e.g., converting cul-de-sacs or dead-end streets to grid streets).

Cost Considerations

Capital and infrastructure costs for improved street connectivity may be high. Depending on the location, losses may also be incurred through the reduction of sellable land due to the increased street footprint. Benefits come mainly from the reduction of traffic on arterial streets, which reduces congestion and allows for safer use of nonmotorized transportation, such as bikes. These outcomes, in turn, can reduce car usage, which provides costs savings to commuters and municipalities.

Expanded Mitigation Options

Pair with Measure T-18, *Provide Pedestrian Network Improvement*, to best support use of the local pedestrian network.

GHG Reduction Formula

$$A = \frac{B - C}{C} \times D$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from vehicle travel in plan/community	0–30.0	%	calculated
User Inputs				
B	Intersection density in project site with measure	[ ]	intersections per sq mile	user input
Constants, Assumptions, and Available Defaults				
C	Average intersection density	36	intersections per sq mile	Fehr & Peers 2009
D	Elasticity of VMT with respect to intersection density	-0.14	unitless	Stevens 2016

Further explanation of key variables:

- (C) – The average intersection density is based on the standard suburban intersection density in the U.S. (Fehr & Peers 2009). This density is approximately equivalent to block faces of 750 to 800 feet, or cul-de-sac–style built environments, which are appropriate for suburban areas.
- (D) – A meta-regression analysis of 15 studies found that a 0.14 percent decrease in VMT occurs for every 1 percent increase in intersection density (Stevens 2016).

GHG Calculation Caps or Maximums

Measure Maximum

(A_{max}) The percent reduction in GHG emissions (A) is capped at 30 percent. The purpose of the 30 percent cap is to limit the influence of any single built environmental factor (such as intersection density).

Subsector Maximum

Same as (A_{max}). Measure T-17 is the only measure at the Plan/Community scale within the Land Use subsector.

Example GHG Reduction Quantification

The user reduces VMT by constructing their project with a higher intersection density than the surrounding city. In this example, the project intersection density (B) would be 72 intersections per square mile (sq mile), which would reduce GHG emissions from project VMT by 14 percent.

$$A = \frac{72\ \frac{\text{int}}{\text{sq mile}} - 36\ \frac{\text{int}}{\text{sq mile}}}{36\ \frac{\text{int}}{\text{sq mile}}} \times -0.14 = -14\%$$

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).

VMT Reductions

The percent reduction in VMT would be the same as the percent reduction in GHG emissions (A).

Sources

- Fehr & Peers. 2009. *Proposed Trip Generation, Distribution, and Transit Mode Split Forecasts for the Bayview Waterfront Project Transportation Study*.
- Stevens, M. 2016. Does Compact Development Make People Drive Less? *Journal of the American Planning Association* 83:1(7–18), DOI: 10.1080/01944363.2016.1240044. November. Available: https://www.researchgate.net/publication/309890412_Does_Compact_Development_Make_People_Drive_Less. Accessed: January 2021.