W-3. Use Locally Sourced Water Supply

GHG Mitigation Potential

Potentially moderate reduction in GHG emissions from water use

Co-Benefits (icon key on pg. 34)

Climate Resilience

Using locally sourced water provides fewer opportunities for extreme events to disrupt the water source due to shorter traveling times. This could also reduce costs associated with obtaining fresh potable water from distant sources.

Health and Equity Considerations

Locally sourced water may have more contaminants than imported options. For potable uses, carefully consider the water quality of the proposed source.

Measure Description

This measure requires use of local water supplies instead of more distant water supplies. Locally sourced water is typically less energy intensive because it does not need to be moved across long distances (unless locally sourced water requires extensive pretreatment to address water quality concerns). Using locally sourced water can thus avoids the higher GHG emissions from energy consumed to pump and move water through larger infrastructure systems, such as the State Water Project.

Scale of Application

Plan/Community

Implementation Requirements

See measure description.

Cost Considerations

Prioritizing locally sourced water reduces costs associated with the transportation of water to the use location. However, regions that are not already large-scale water producers will most likely require significant investment in water extraction, processing, management, and potentially reuse in order to meet demand.

Expanded Mitigation Options

Install onsite water collection systems, such as a rain barrels or cisterns, for even more local water supply, reducing the associated energy and GHG emissions from water transmission.

GHG Reduction Formula

$A1 = \mathbf{C1} \times (D - \mathbf{E})$ (Energy savings)

$B1 = A1 \times F \times G \times H$ (Emissions reduction)

$B2 = \mathbf{C2} \times \frac{D-E}{D}$ (Percent emissions reduction)

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A1	Energy savings from using local water	[ ]	kWh	calculated
B1	GHG reduction from using local water	[ ]	MT CO_2e	calculated
B2	% GHG reduction from outdoor water use	[ ]	%	calculated
User Inputs				
C1	Amount of water to be obtained from local sources	[ ]	AF	user input
C2	Percentage of water from local sources (relative to total water demand)	[ ]	%	user input
E	Electricity required to treat and distribute local water	[ ]	kWh/AF	user input
Constants, Assumptions, and Available Defaults				
D	Electricity for municipally provided water	Table W-1.1	kWh per AF	CPUC 2016
F	Conversion from kWh to MWh	0.001	MWh per kWh	conversion
G	Carbon intensity of local electricity provider	Tables E-4.3 and E-4.4	lb CO_2e per MWh	CA Utilities 2021
H	Conversion from lb to MT	0.000454	MT per lb	conversion

Further explanation of key variables:

- (E) – The water energy-intensity factor for the local water source must be defined by the user.
- (D) – The water energy-intensity factors are derived from the most recent version of the CPUC Water Energy Calculator and are provided in Table W-1.1 in Appendix C (CPUC 2016). The energy intensity factors rely on region-wide average values for DWR's 10 hydrologic regions.
- (G) – GHG intensity factors for major utilities in California are provided in Tables E-4.3 and E-4.4 in Appendix C. If the project study area is not serviced by the listed electricity provider, or the user is able to provide a project-specific value (i.e., for the future year in which the project begins local water use), the user should replace these defaults in the electricity consumption GHG calculation formula.

GHG Calculation Caps or Maximums

None.

Example GHG Reduction Quantification

The user reduces GHG emissions from water-related electricity by using locally sourced water. In this example, the project is in the South Coast hydrologic region and uses 46 AF per year of water. The user chooses to supply 100 percent of the water for the project (C1, C2) from an alternative local source that has a water energy-intensity of 1,200 kWh per AF (E). The electricity provider for the project area is Burbank Water and Power and the analysis year is 2029. The carbon intensity of electricity is therefore 218 lbs CO_2e per MWh (G).

$$A1 = \mathbf{46\ AF} \times \left(1{,}898\frac{kWh}{AF} - \mathbf{1{,}200}\ \mathbf{\frac{kWh}{AF}}\right) = 32{,}108\ kWh$$

$$B1 = 32{,}108\ kWh \times 0.001\frac{MWh}{kWh} \times 218\ \frac{lb\ CO_2e}{MWh} \times 0.000454\frac{MT}{lbs} = 3.2\ MTCO_2e$$

$$B2 = \mathbf{100\%} \times \frac{1{,}898\frac{kWh}{AF} - \mathbf{1{,}200}\mathbf{\frac{kWh}{AF}}}{1{,}898\frac{kWh}{AF}} = 37\%$$

Quantified Co-Benefits

Energy and Fuel Savings

Energy savings (A1) are derived in the steps above that are necessary to quantify GHG reductions.

Sources

- California Public Utilities Commission (CPUC). 2016. Water-Energy Calculator–Draft Version 1.05. Available: https://www.cpuc.ca.gov/nexus_calculator/. Accessed: January 2021.
- California Utilities. 2021. Excel database of GHG emission factors for delivered electricity, provided to the Sacramento Metropolitan Air Quality Management District and ICF. January through March 2021.