

Evaluating Consumer Choice in Conserving Water Resources via the Water-Energy-Food Nexus

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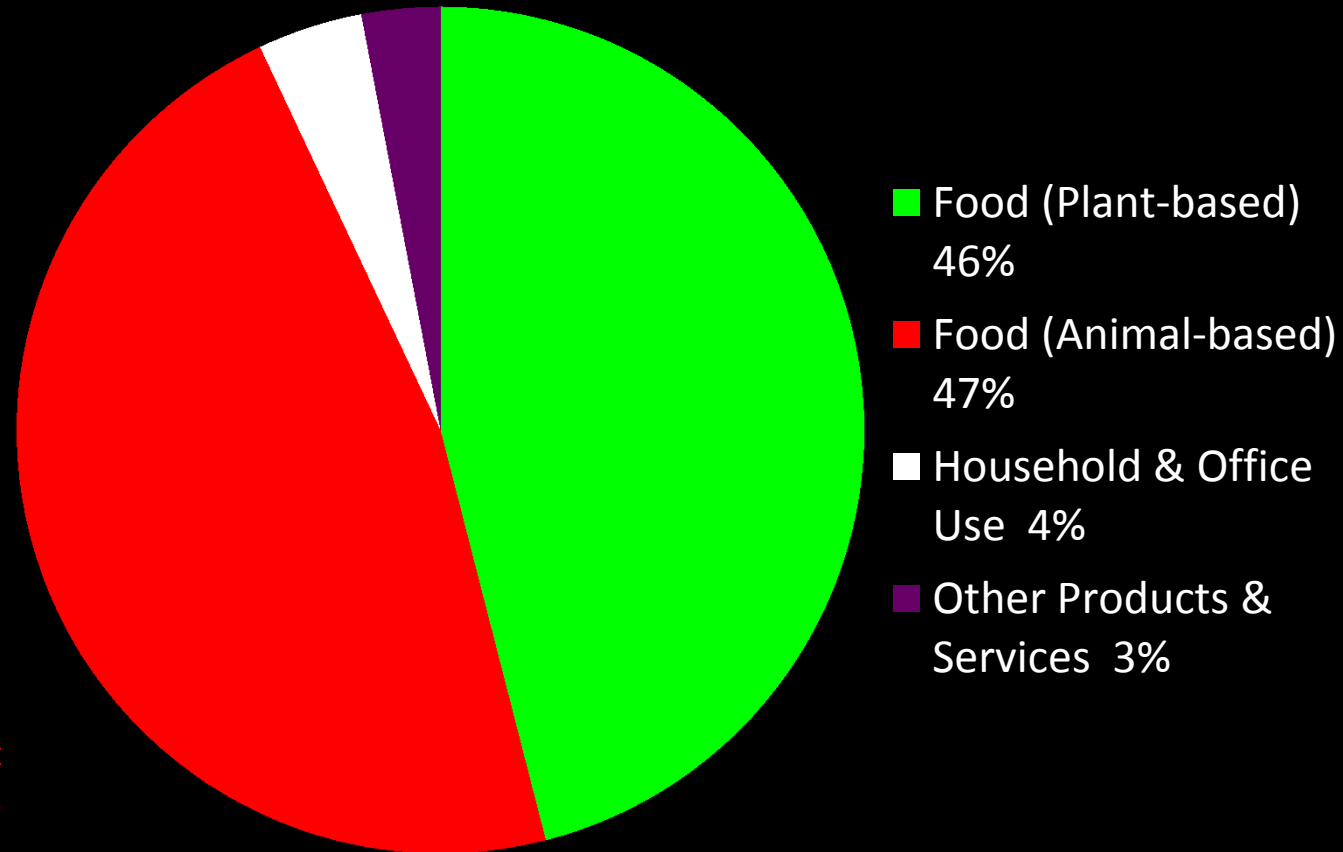


2017 WORLD WATER CONGRESS XVI

Questions about California's Water

- Can the drought be addressed solely by supply-side solutions (i.e., producing more water)?
- Which demand-side actions by residents are most effective in conserving scarce local water resources (e.g., food and energy choices, direct water use)?
- What political or behavioral changes are likely to result from knowing the answers---or not knowing?

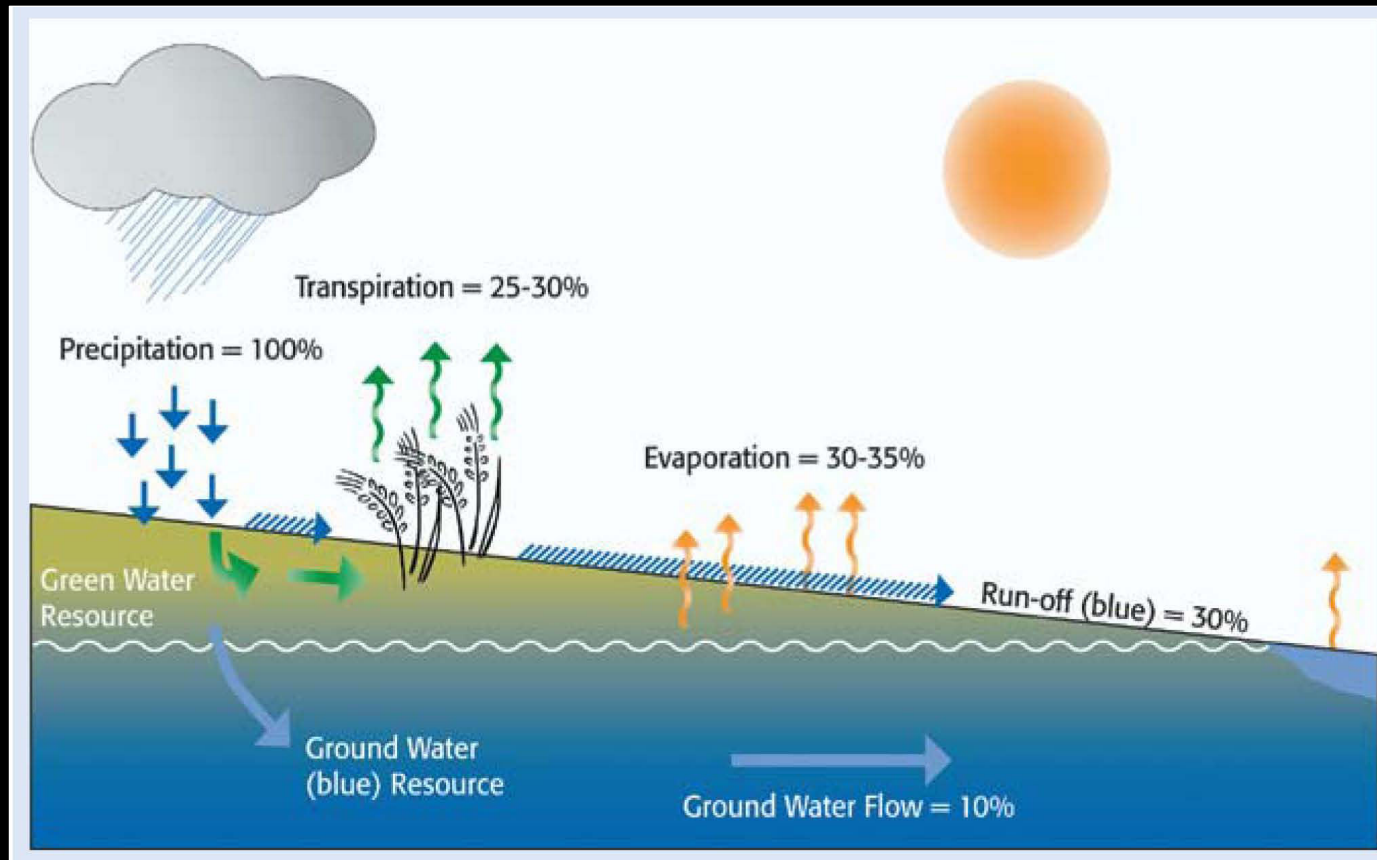
California's Total Water Footprint



Based on
data from
Fulton et
al. 2012

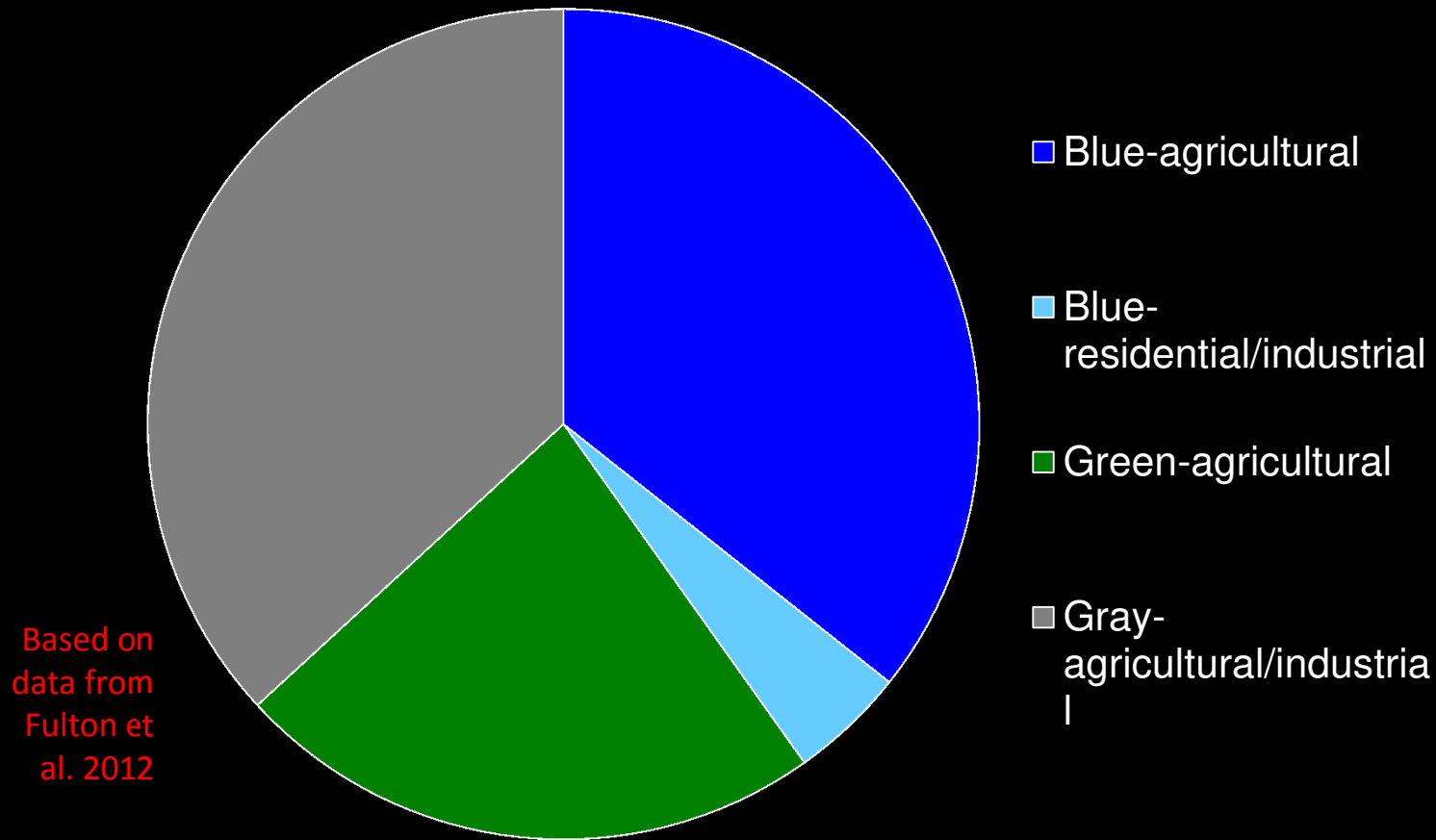
Uses of local and imported water (actual/virtual)

Blue and Green Water Resources



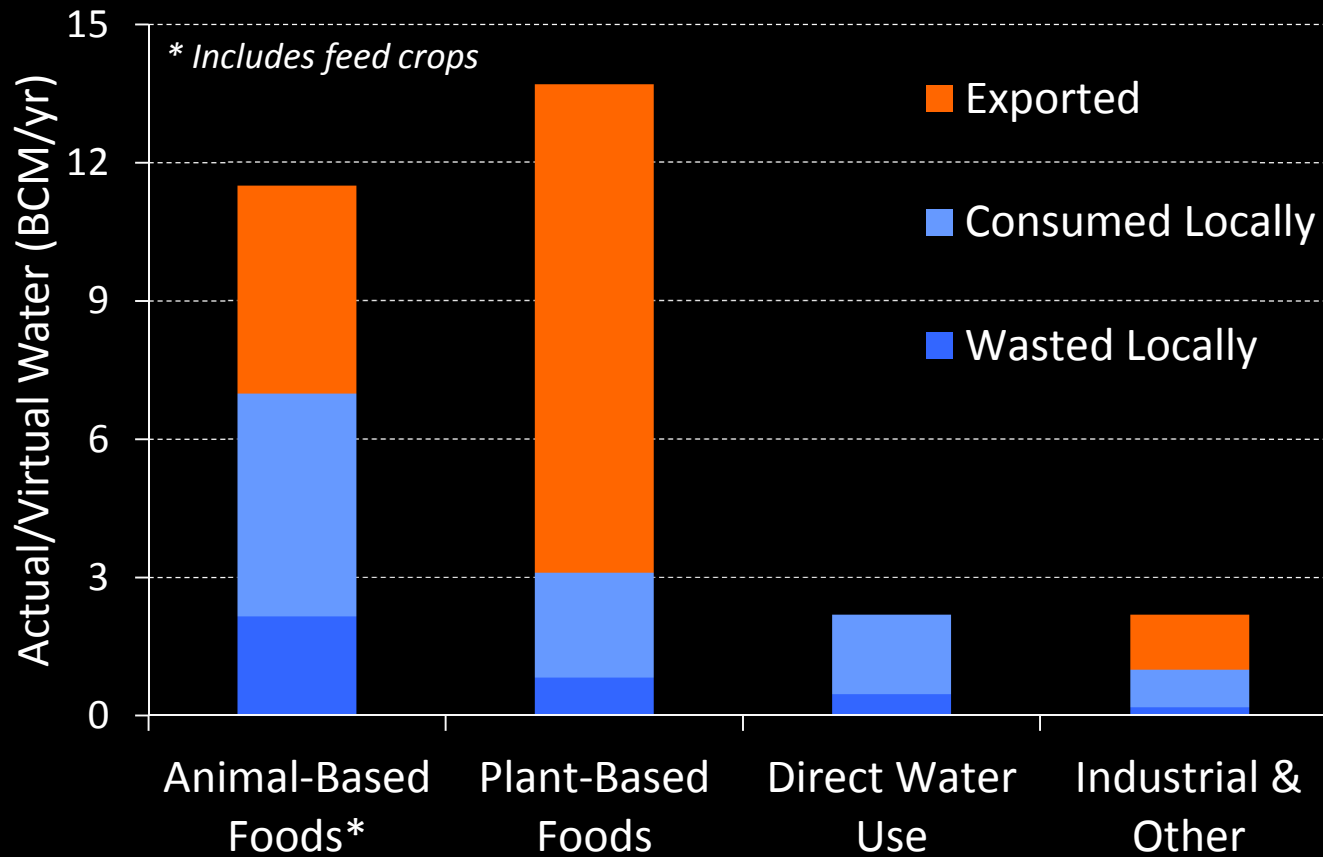
Lundqvist et al., 2008

California's Local Water Production



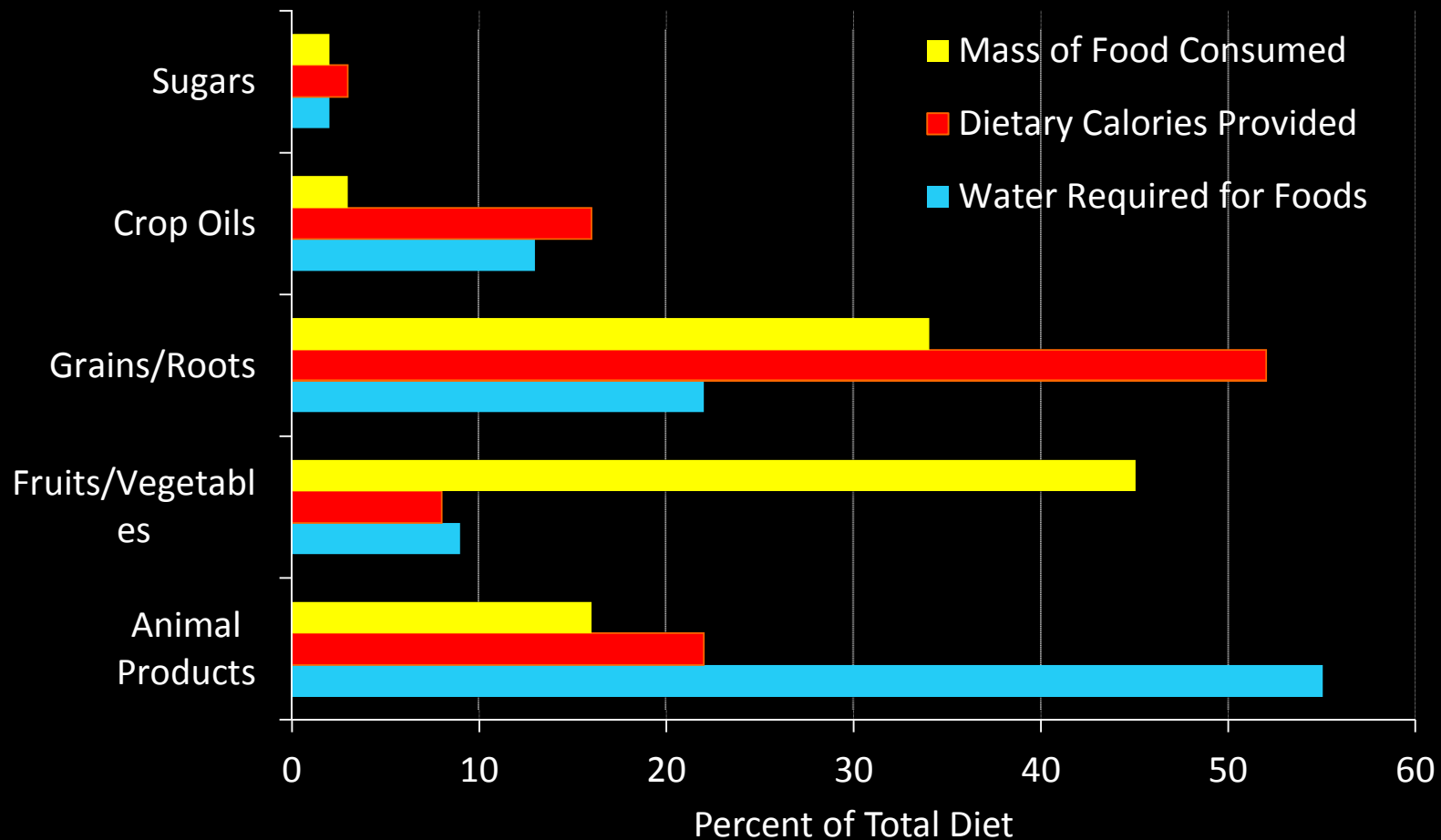
For in-state products/services (used locally or exported)

Local Blue Water Allocations



45% consumed or wasted locally and 55% exported

Water versus Food Calories or Mass



Based on data from Liu & Savenije 2008

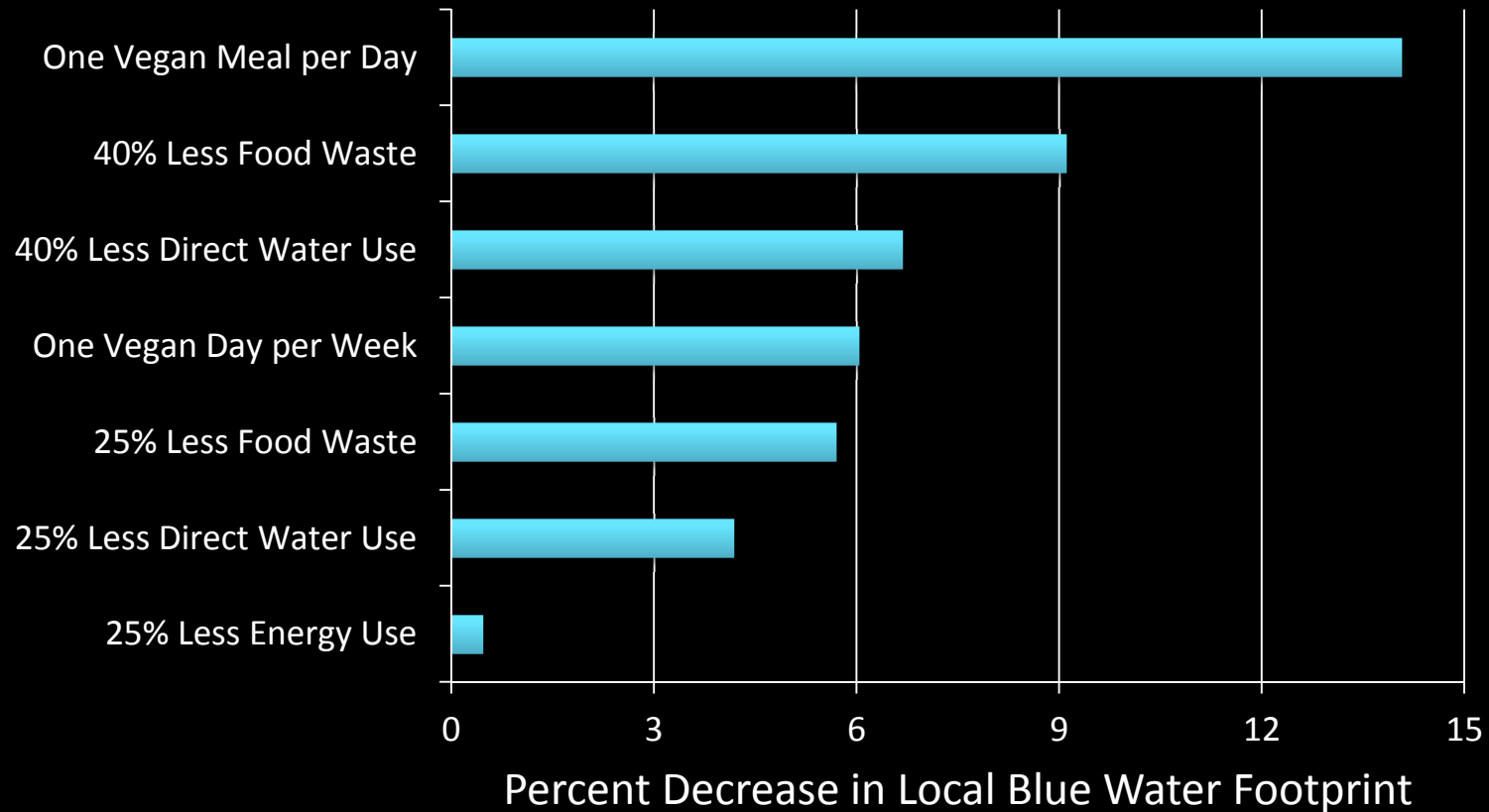
Energy Sources & Water Demand

Energy Source (1 kg)	Required Production Water (liters)	Average Water Footprint (m ³ /GJ)
Coal	0.95	0.16
Natural Gas	1.6	0.04
Crude Oil	3.7	1.1
Alternative Oil	8.8	10-25*
Biofuels	9.7	72

* Estimated from production and grey water demands

Based on data from Euromoney Energy 2014; Gerbens-Leenes et al. 2008

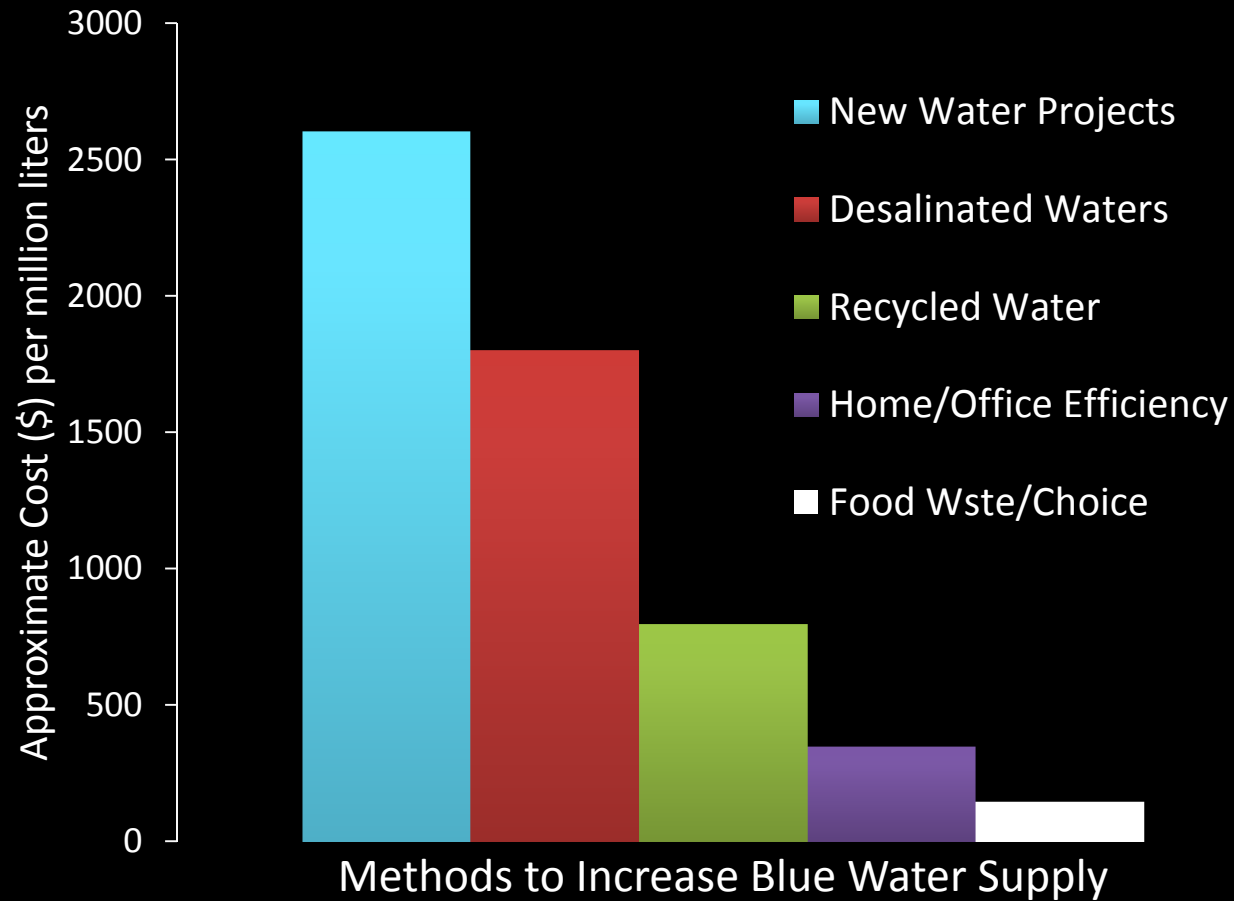
California Blue Water Conservation



Focusing on the Food Sector

- Wasted food now accounts for one-third of total
- Animal-based foods require more land, energy and water than plant-based foods
- Residents of industrialized nations consume animal protein at 2 to 3 times recommended
- Drought effects cannot be addressed by supply-side factors alone if 40% reduction is necessary

Supply- and Demand-Side Costs



Data from California Water Plan 2013; Marrin 2014

Summary Observations

- Consumer food choices unlikely to be mandated
- Food wastage is difficult to control (safety issues)
- Supply-side solutions are more acceptable, but less effective for short-term drought challenges
- Residents must voluntarily shift food habits to conserve local water resources, despite a greater impact than reduced household or energy use