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A Multi-Benefit Framework for Water Management: Sustainable Landscapes Test Case

PACIFIC INSTITUTE

CALIFORNIA WATER EFFICIENCY PARTNERSHIP
A Chapter of the Alliance *for* Water Efficiency

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Questions for Today

What are the multiple benefits and trade-offs of water management? Why should I care?

How can businesses evaluate the multiple benefits and costs of a sustainable landscape project?

How can water utilities use multiple benefits to help to advance investment in sustainable landscapes?

Water Management Strategies

Dams and Reservoirs

Stormwater Mngmt

Watershed Protection

Desalination

Reuse

Ag Efficiency

GW Recharge

Water Transfers

Urban Efficiency

Demand Management Strategies

Multiple Benefits (and costs) of Water Management

Water Supply
Supply augmentation
Demand reduction

Flood Control
Total flood volume
Peak flood volume

Water Quality
Ambient water quality
Drinking water quality

Energy
Energy for water systems
Energy for wastewater
End-use energy demand
Secondary energy demand
Energy production potential

Land and the Environment
Air quality (including GHG)
In-stream flows
Habitat and biodiversity
Carbon sequestration
Extreme events
Soil health
Agricultural yields
Agricultural quality
Resource recovery

Risk and Resilience
Water supply reliability
System resilience
Regulatory compliance
Reputation

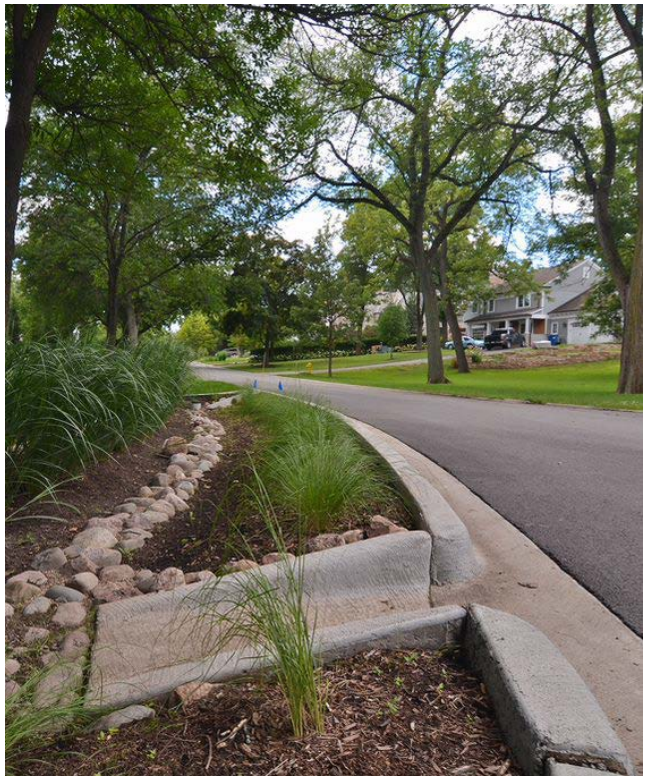
People and Community
*Defined by stakeholders

Local economy
Community resilience
Urban heat island
Human health
Recreation
Educational opportunity
Local food production
Community livability and aesthetics
Water affordability

Why Incorporate Multiple Benefits into Water Efficiency?

Incorporating multiple benefits and trade-offs can help to:

- Broaden support for policies or projects;
- Identify opportunities to share costs among project beneficiaries;
- Minimize adverse and unintended consequences;
- Promote equitable and transparent distribution of benefits and costs; and,
- Optimize the investment of time, money, and other resources.



Proposed Multi-Benefit Framework

Step 1: Define water management goals and project options
What are your water management goals and project options?
Which stakeholders should be at the table?

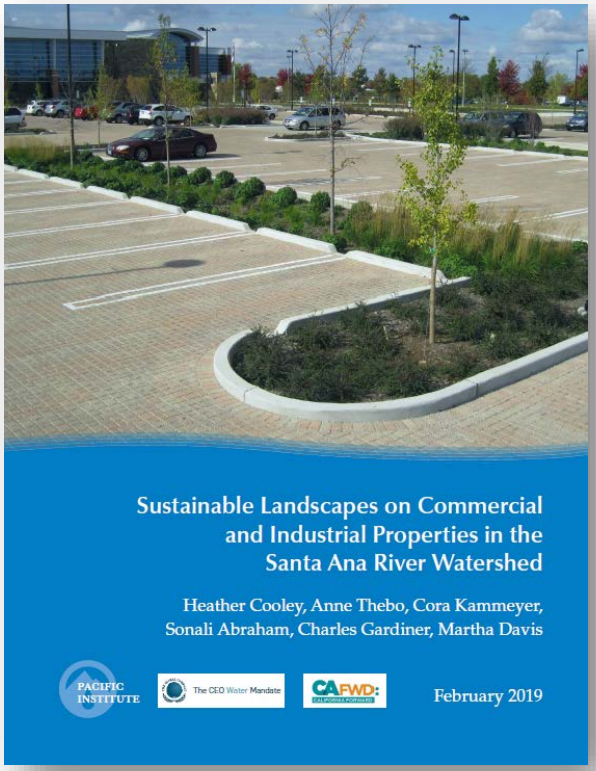
Step 2: Identify benefits and trade-offs
What are the potential benefits and trade-offs of the project options? Are there additional stakeholders to engage as beneficiaries?

Step 3: Characterize Key Benefits and Trade-offs
What analyses are needed to inform decision-makers?
What are the quantitative or qualitative benefits of the project options?

Step 4: Inform Decision Making
How should this information be communicated to inform decision-making?

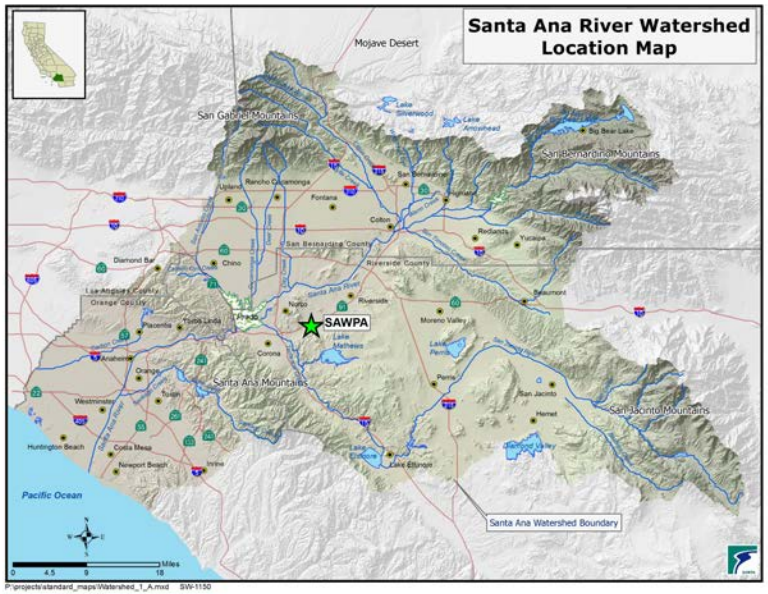
Multi-Benefit Test Cases

Sustainable Landscapes on Commercial Properties in southern California



Distributed Rainwater Capture in Austin, Texas

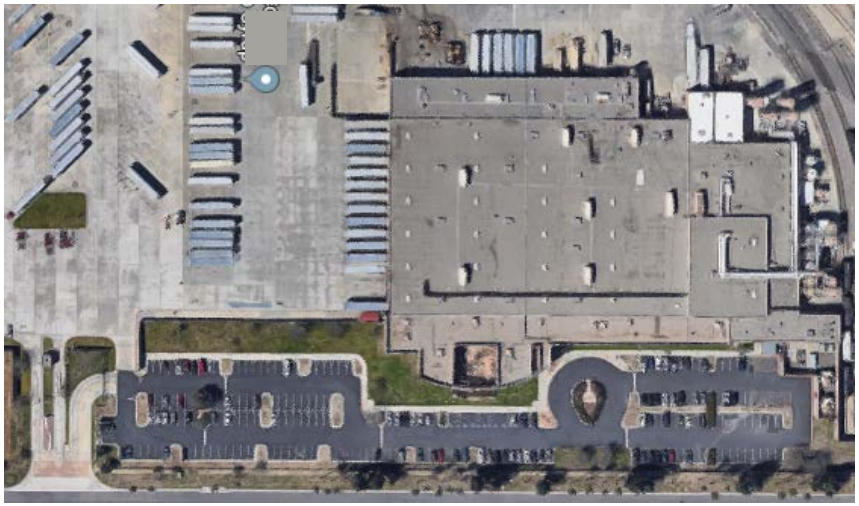
Santa Ana Test Case:
Sustainable Landscapes on CI properties

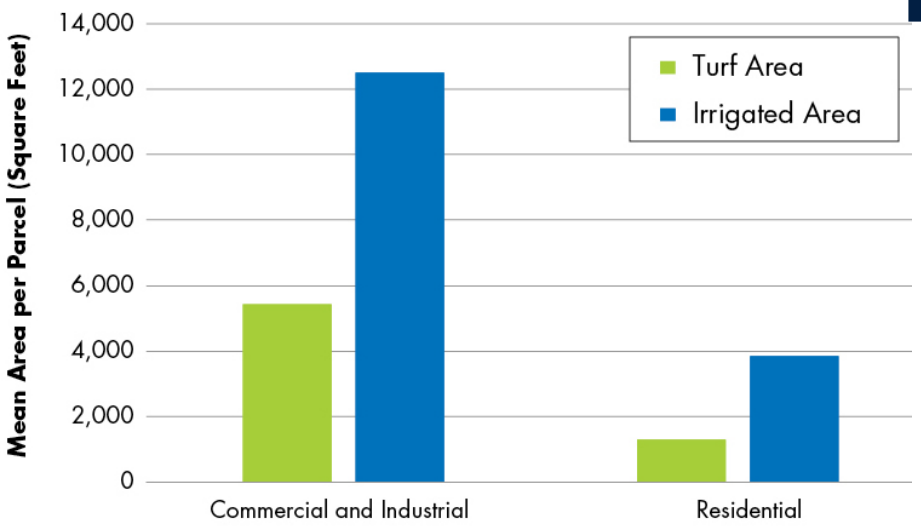


How can business owners evaluate the multiple benefits and costs of a sustainable landscape project?

How can water utilities use a multi-benefit approach to help to advance investment in sustainable landscapes?

Identifying Opportunities and Strategies (Step 1)





Identifying Potential Benefits (Step 2)

SITE PHOTOS

AREA 1B

AREA 1A

SITE CONDITIONS

AREA 1

		key
DRAINAGE & GRADING		
Schematic provided? (Y/N)	N	
Where does stormwater flow?		
Visible stormdrains (catch basin)		
Planter drains		
Swale, concrete		
Swale, vegetated		
Swale, cobble		
Hidden / built-in gutters to stormdrain		
Building gutters to impermeable surface		
Building gutters to planted area		
Area drains in hardscape		
Soil compacted? (Y/N)	N	
HARDSCAPE		
Continuous concrete or asphalt	X	
Gravel, DG, cobblestone, other		
IRRIGATION		
Schematic provided? (Y/N)	N	
Spray	X	
Drip		
Rotors		
Recycled water? (Y/N)	Y	
Visible breakage? (Y/N)	N	
Overwatering (soggy underfoot)? (Y/N)	N	
Visible ponding? (Y/N)	N	
Dry spots? (Y/N)	N	

		key
PLANTING		
Plant type		
Turf	X	A
High water-use plants	X	
Medium water-use plants		
Low water-use plants	X	
California native plants		
Trees	X	
Visual appearance		
Overgrowth		
Healthy growth	X	
Wilted	X	
Yellowing		
Dead		
Brown patches	X	
Moss		
MAINTENANCE		
Use of pesticides? (Y/N)	Y	
Use of herbicides? (Y/N)	Y	
Regular manicuring required? (Y/N)	Y	B
Mulch present? (Y/N)	X	C
Man-hours spent per week on maintenance (per owner)		
NOTES		
Red Apple (Apetinia cordifolia) is		D
invasive in neighboring Los Angeles		
County. Use with caution.		
No shade trees present over benches.		

Developed with G3

Quantifying Benefits (Step 3)

WATER CALCULATIONS

PROPERTY ADDRESS

	Area (square feet)	Annual Water Use (gallons)	Annual Water Savings (gallons)
AREA 1A: Entry Island 1			
Existing landscape	5530	190,630	
Convert spray to drip, decrease runtime	5530	71,486	119,144
Convert spray to MP rotators	5530	127,087	63,543
AREA 1B: Entry Island 2			
Existing landscape	7500	413,664	
Convert turf & high water use plants & install drip	7500	96,953	316,712
Replace with rotary nozzles	7500	275,776	137,888
AREA 2: Main Building Plaza			
Existing landscape	5000	206,832	
Convert spray to drip	5000	129,270	77,562
Convert annuals & high water use plants & install drip	5000	64,635	142,197
AREA 3: Interior Courtyard			
Existing landscape	4000	220,621	
Convert high water-use plants & install drip	4000	51,708	168,913

Five Themes of Benefits

- **Water savings potential**
- **Energy and GHG savings**
- **Habitat and Biodiversity**
- **People**
- **Risk and Resilience**

Informing Decision-Making (Step 4)

		Rain garden plus slow release cistern	Rain garden with use of water from cistern	Rain garden and cistern w/ climate-appropriate plants and garden	Rain garden, cistern, and tree
Water	Reduce water use				
	Reduce stormwater runoff				
	Reduce nuisance flooding and water damage				
Energy	Reduce energy consumption on-site				
Land and Environment	GHG concentrations avoided or reduced				
	Extend baseflow				
	Improve soil health				
	Increase native habitat				
	Reduce mosquito breeding locations				
	Reduce urban heat island effect				
Risk and Resilience	Improved reputation				
	Reduce risk of water supply shortfall				
	Meet regulatory targets				
People and Community	Improve aesthetics				
	Create or support green jobs				
	Reduce landscape maintenance time				
	Reduce lawn mowing and green waste				
	Decrease hardware purchasing or maintenance				
	Reduce fertilizer and pesticide use				
Cost Considerations	Total Cost				
	Cost to Stakeholder				

- Develop key deliverables for decision makers and stakeholders
- Businesses, homeowners, municipalities/departments

Example: Develop summary table of prioritized outcomes for businesses.

Agency Programs: Landscape Transformation (Residential)

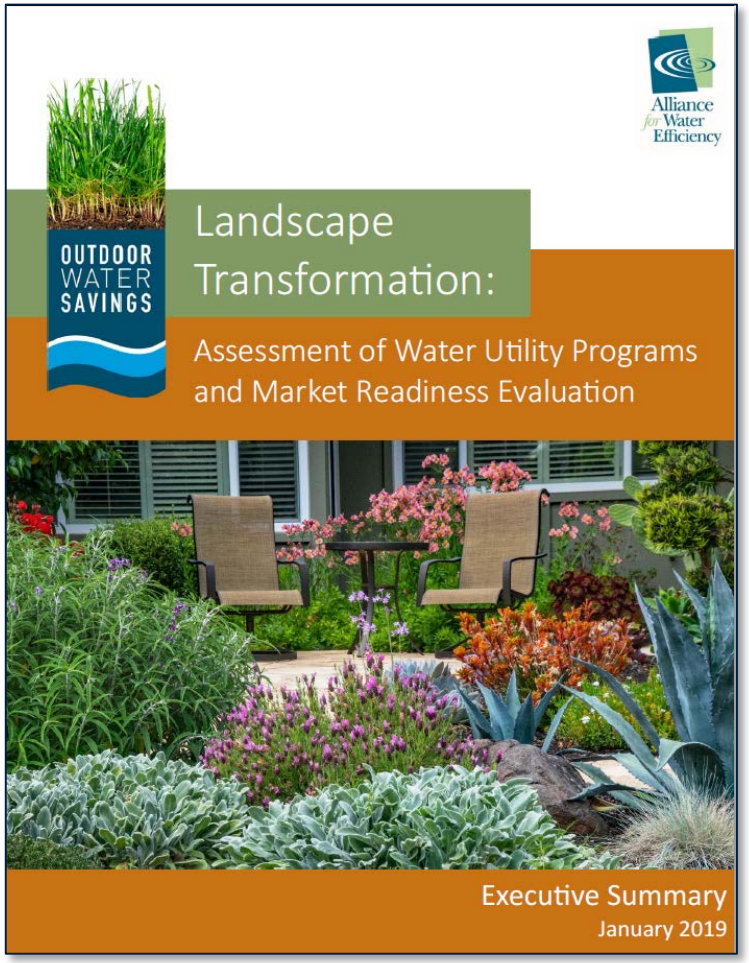
The average participant water use savings for single family customers ranged from **7%** up to **39%**.

City of Sacramento

Population served: 480,000
Average annual precipitation: 17.0 inches
Program type: Turf removal and replacement
Average participant savings: 29.6 percent

City of Petaluma

Population served: 60,200
Average annual precipitation: 25.0 inches
Program type: Free distribution of mulch
Average participant savings: 13.3 percent



Source: Alliance for Water Efficiency, Landscape Transformation: Assessment of Water Utility Programs and Market Readiness Evaluation, January 2019

Landscape Transformation Elements:

1. Turf Replacement

2. Bioswales and Rain Gardens

3. Permeable Pavement

Source: BanksPhotos, iStock

4. Green Roofs

Source: Maxvis, iStock

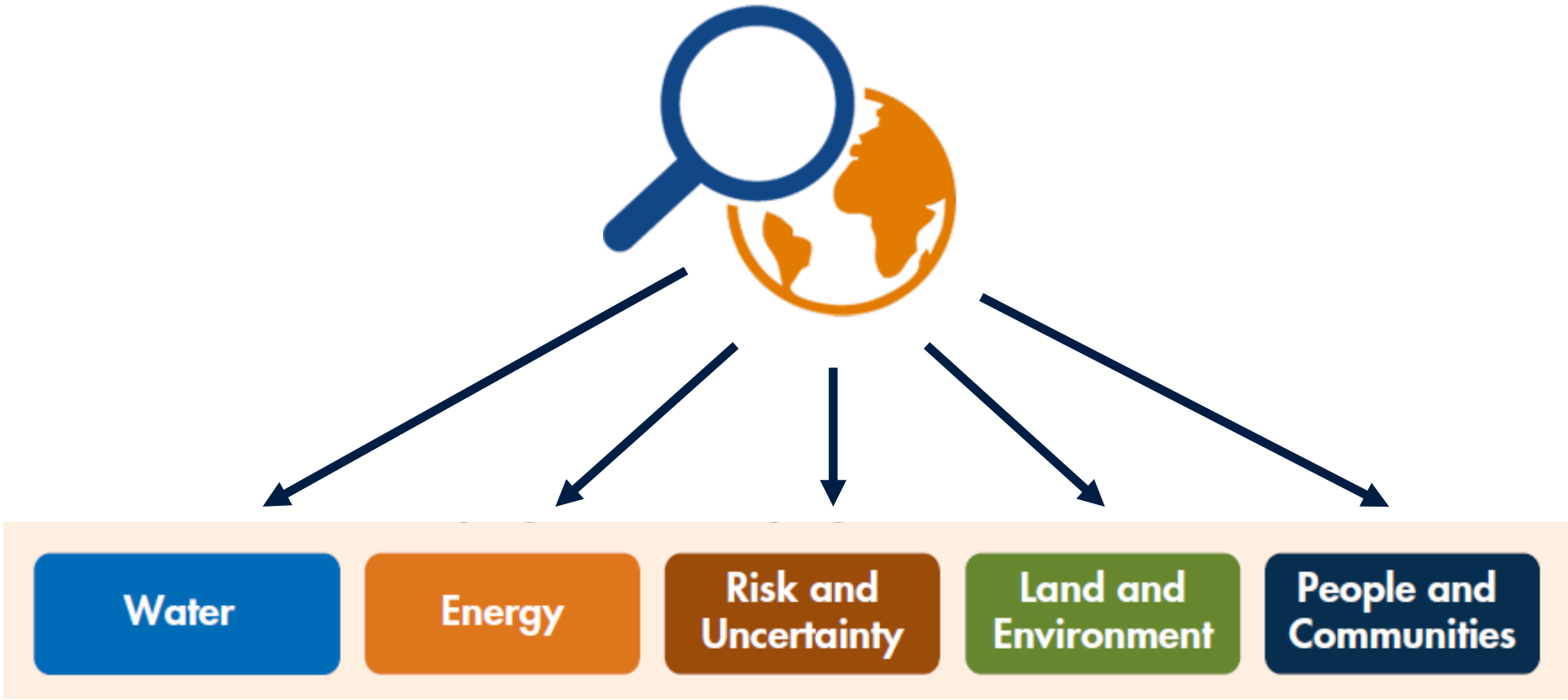
5. Rain Tanks and Cisterns

Source: Sharon Wills, iStock

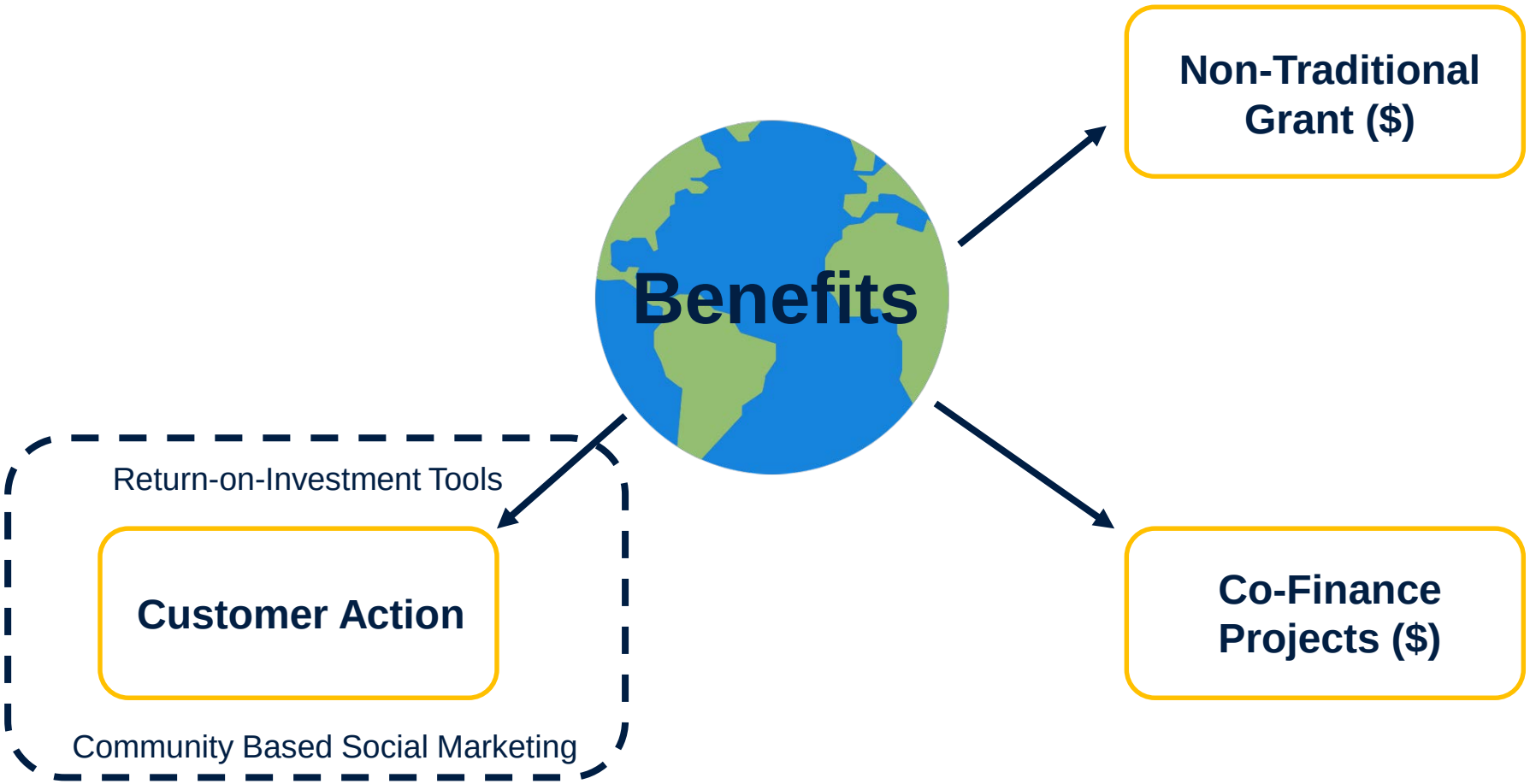
Source: Pacific Institute, Sustainable Landscapes on Commercial and Industrial Properties in the Santa Ana River Watershed, February 2019

Characterizing Benefits (Step 3)

Benefits of sustainable landscapes:



Implementing the Multi-Benefit Framework



Characterizing Benefits
People: Property Value

LANDSCAPE TOOL SERIES

MULTI-BENEFITS OF LANDSCAPE TRANSFORMATION

PEOPLE & COMMUNITY: PROPERTY VALUE

Introduction

Commercial property owners are less likely to take advantage of agency-sponsored landscape transformation rebate and incentive programs than their residential counterparts. The Pacific Institute (2019) suggests that landlords and owners of commercial properties, if made aware of the potential financial gains, including increased rent, associated with sustainable landscapes might become motivated to make the investment. As Clements and St. Julianna (2013) explain in their publication The Green Edge: How Commercial Property Investment in Green Infrastructure Creates Value, the integration of Green Infrastructure (GI) can help property owners save on their utility bills while also reaping "higher rents and property values," and "increased retail sales" among other environmental and social benefits. Primary research conducted by Laverne and Winson-Geideman (2003) found "landscaping with a good aesthetic value added approximately 7 percent to the average rental rate of a building" for 85 commercial office buildings in Cleveland, OH. Wolf (2003) analyzed 270 survey responses from city dwellers within revitalized business districts and found that the presence of trees within a commercial retail setting were associated with a willingness to travel more often, as well as farther and longer to patronize businesses. These same respondents were also willing to stay at the commercial space longer and pay more for parking. Finally, the same study reported a 12 percent increase in willingness to pay for goods when the retail space contained vegetated streetscapes. Kaplan (2007) analyzed nature preferences from 49 surveyed employees of 41 businesses along a

In their 2019 report *What Home Buyers Really Want*, the

family homes in Portland, Oregon increased by $5.62 monthly from an additional tree on the lot,

Primary Resources

California Home Prices Taking Hit as Lawns Turn Brown During Drought. June 13, 2014. SACRAMENTO (CBS13). https://sacramento.cbslocal.com/2014/06/11/california-home-prices-taking-hit-as-lawns-turn-brown-during-drought/

Center for Neighborhood Technologies, and American Rivers. 2011. *The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental and Social Benefits.* Chicago, Ill.: Center for Neighborhood Technologies. https://www.cnt.org/publications/the-value-of-green-infrastructure-a-guide-to-recognizing-its-economicenvironmental-and

Clements and St. Juliana. 2013. "The Green Edge: How Commercial Property Investment in Green Infrastructure Creates Value." Natural Resources Defense Council.

Cooley, Heather, Anne Thebo, Cora Kammeyer, Sonali Abraham, Charles Gardiner and Martha Davis. 2019. *Sustainable Landscapes on Commercial and Industrial Properties in Santa Ana River Watershed.* Oakland, Calif.: Pacific Institute.

Henry, Mark S. 1994. The Contribution of Landscaping to the Price of Single Family Houses: A Study of Home Sales in Greenville, South Carolina. *Environmental Horticulture.* 12 (2): 65-70.

Kaplan, R. 2007. Employees' Reaction to Nearby Nature at Their Workplace: The Wild and the Tame. *Landscape and Urban Planning.* 82 (1-2): 17-24.

Laverne, Robert J. and Kimberly Winson-Geideman. 2003. The Influence of Trees and Landscaping on Rental Rates at Office Buildings. *Arboriculture.* 29 (5): 281-290.

National Association of Home Builders. *What Home Buyers Really Want.* 2019.

Ward, Bryce, Ed MacMullan, Sarah Reich. 2008. *The Effect of Low-Impact-Development on Property Values.* Portland, OR: ECONorthwest.MacKerron and Mourato. 2013. "Happiness is greater in natural environments." *Global Environmental Change.* 23 (October), no. 5: 992-1000. https://doi.org/10.1016/j.gloenvcha.2013.03.010

Characterizing Benefits
People: Property Value

Quantitative Findings

- Ward et al. (2008) found that the installation of **Green Infrastructure** within select Seattle neighborhoods helped increase property values between **3.5%** and **5%**.

Qualitative Findings

- Kaplan (2007) found that the most satisfied employees from 41 businesses in Ann Arbor, MI were those who had an outdoor view. These same individuals, *"appreciated that they could see **birds** and other animals, the general appearance of the area outside, as well as the number and size of **trees**."*
- **Manicured lawns** at the place of employment *"had no bearing on participants' satisfaction with any aspect of the natural environment, or its general appearance."*

Tools and Resources for Water Managers

- **Pacific Institute's Reports & Multi-benefit Resource Library (over 150 primary resources)**
  - https://pacinst.org/multiplebenefits
- **CalWEP's Sustainable Landscaping Benefits Resource Page**
  - www.CalWEP.org/landscapingbenefits
  - Benefit Cut-Sheets (Water, Energy, People & Communities)
- **ROI Landscape Transformation Calculators:**
  - City of Santa Rosa's Landscape Water Management ROI Calculator (end-user: water and landscape professionals)
  - River Friendly Landscaping Benefits Calculator (end-user: property owners)

Key Take-Aways and Next Steps

- Opportunity for landscape transformations on commercial properties
- Commercial customers care about additional benefits
- Pacific Institute and CalWEP are developing resources for engaging with businesses

Questions and Contact

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