



Toward an understanding of residential water conservation behaviors on Oahu

Daniele Spirandelli^{1,4}, Michael Roberts^{2,3,4},
Kim Burnett³, Christopher Wada³, Theresa Dean¹

¹Department of Urban and Regional Planning

²Department of Economics

³University of Hawaii Economic Research Organization

*⁴Sea Grant College Program
University of Hawaii-Manoa*

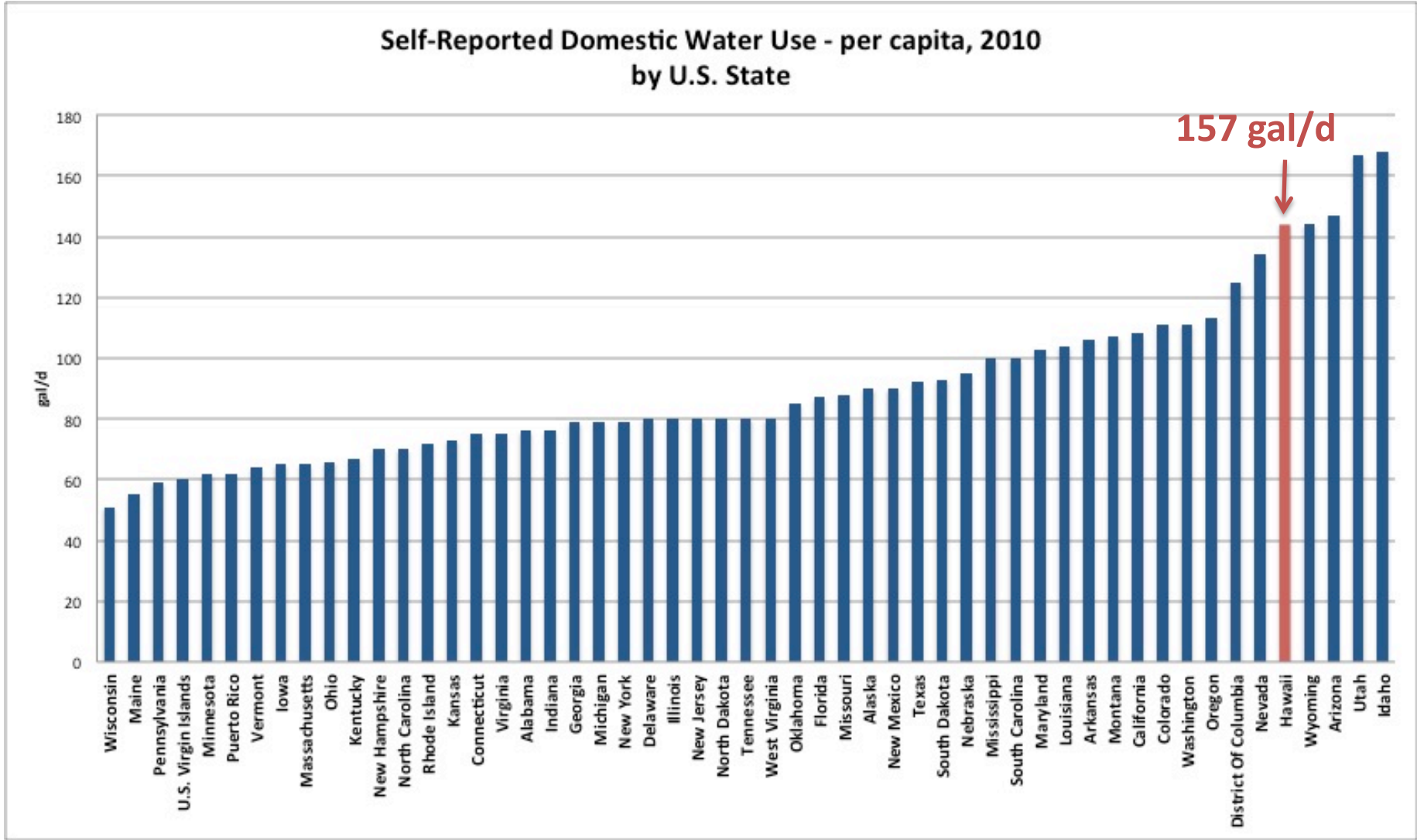


Overview

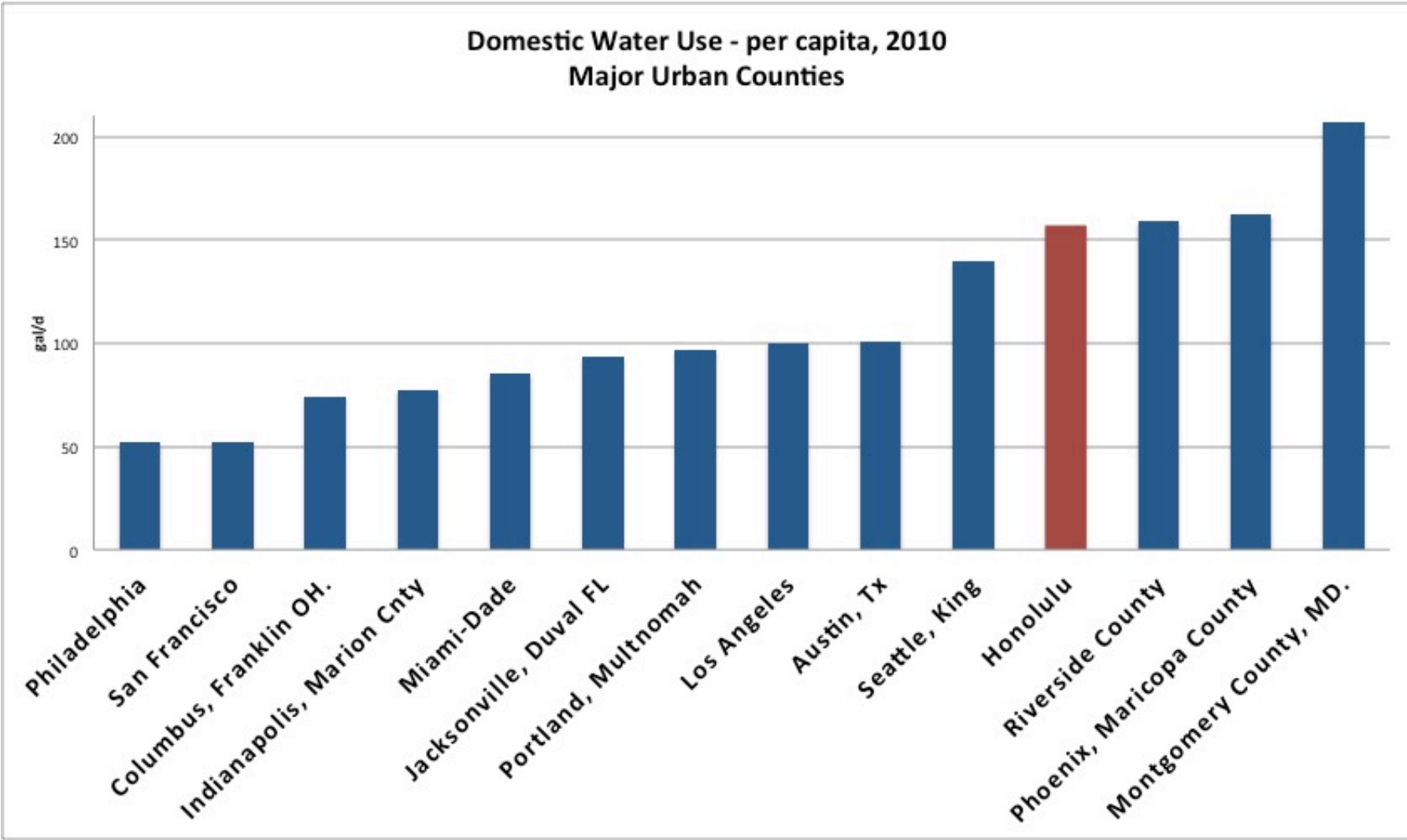
- Residential water consumption
- Oahu survey
- Preliminary results
- Next steps



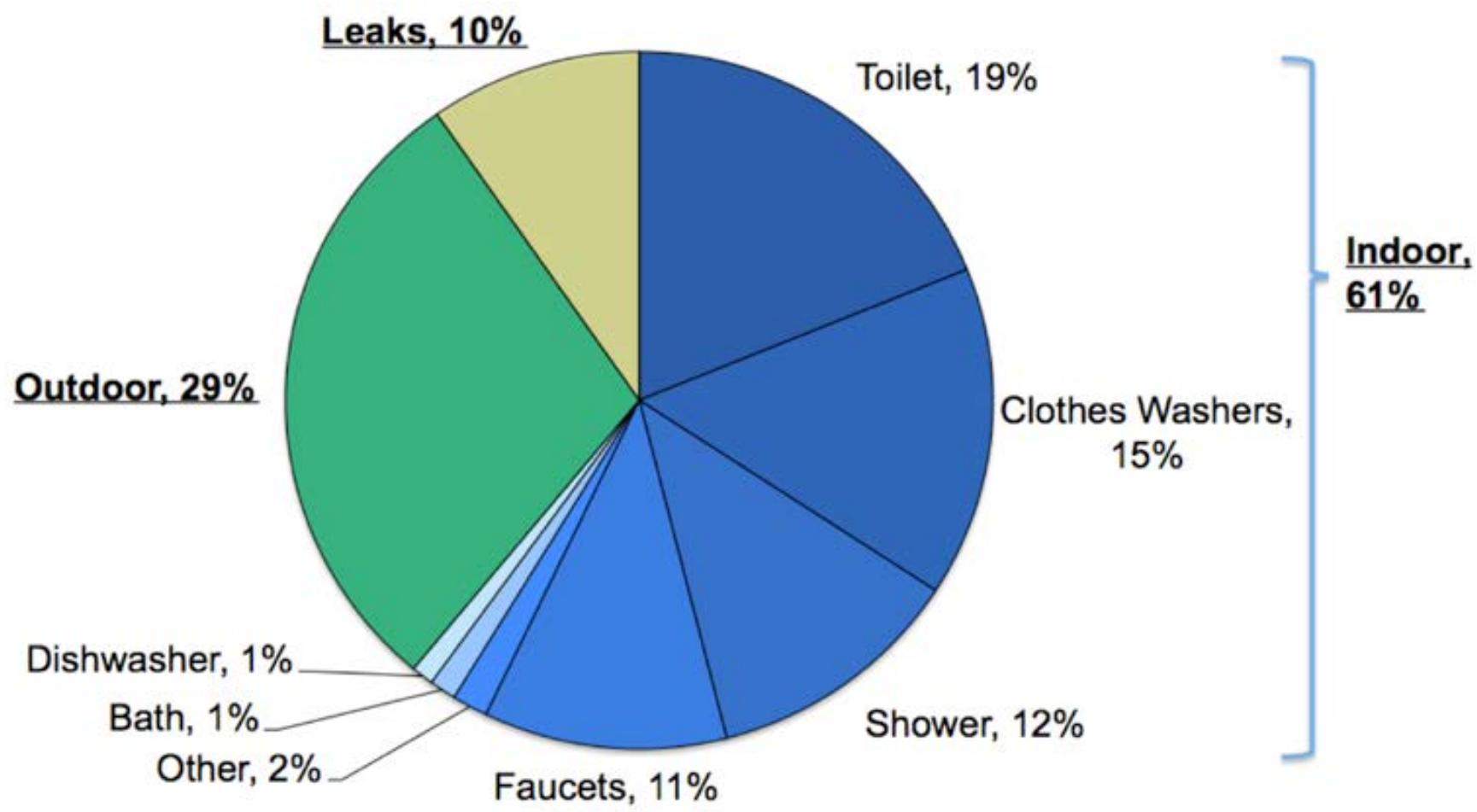
U.S. Domestic Water Consumption by State



U.S. Domestic Water Consumption by Major Urban Counties



Typical residential water use



Indoor water use



2.5
ga./min
ute



3-20
ga./load



<27 – 54
ga./ load



<1.28 - 1.6
ga./ load

Outdoor water use



> 100
ga. /day



Factors associated with household water consumption

Price

- Uniform pricing
- Volumetric pricing
- Block-rate pricing

Non-price

- Efficiency technologies
- Education campaign
- Rebates
- Rationing

Other factors

- Land use, built environment
- Climate
- Socio-demographics
- Environmental attitudes & values (Ajzen, 1991)
- Water use habits (Shove, 2004)

Boyer et al. 2014; Schultz, P. Wesley, et al. 2014; Pullinger et al. 2013; Fielding et al. 2012; House-Peters and Chang, 2011; Grafton et al. 2011; Mansur & Olmstead, 2007; Inman and Jeffrey, 2006; Zhang and Brown 2005; Campbell et al., 2004; Arbues et al. 2003.

Objectives

- Explore household water use behaviors, habits, and personal efforts toward water conservation
- Examine motivations & public attitudes
- Explore what factors are associated with household water consumption patterns
- Awareness of conservation programs

Approach

- On-line survey
 - Hawai'i Panel administered by Ward Research, Inc.
- Link to Honolulu Board of Water Supply water use data



WARD RESEARCH
INCORPORATED



1. [Q1]What type of residence do you live in?

16. Please select all property characteristics, devices and home appliances you currently own.

Home Appliances				Outdoor Property Characteristics					
Air Conditioning [Q16A]	Dish Washer [Q16B]	Clothes Washer [Q16C]	Low Flow Toilets [Q16D]	Lawn [Q16E]	Garden [Q16F]	Outdoor Watering System [Q16G]	Swimming Pool/Hot Tub [Q16H]	Vehicles (Car/Van) [Q16I]	None [Q16J]
1	2	3	4	5	6	7	8	9	10

21. (IF NO IN Q17) If you were to purchase a new dishwasher and/or clothes washer, how important are the following features when deciding on which model to purchase?

	Not Important	Neutral/Not Sure	Slightly Important	Important	Very Important
	1	2	3	4	5
Model Features (Including: Brand, Size, Color/ Finish) [Q21A]					
Customer Reviews [Q21B]					
Water Efficiency (Energy Star) [Q21C]					
Price [Q21D]					
Rebate Offered [Q21E]					

40. How important are the following factors influencing your choice in outdoor garden/landscape (e.g. ornamental or vegetable patch, lawn, xeriscape)?

	Not At All Important	Neutral/Not Sure	Somewhat Important	Important	Extremely Important
	1	2	3	4	5
Aesthetics[Q40A]					
Weekly/Daily Landscape Maintenance[Q40B]					
Food Supplement[Q40C]					
Outdoor Entertainment/ Activities[Q40D]					
Reduce Water Bill[Q40E]					

43. How often do you do the following:

	Never	Sometimes	Most times	Always
	1	2	3	4
Turn off water while brushing teeth[Q43A]				
Let the tap run when requiring cool water[Q43B]				
Have plants with low water needs[Q43C]				
Wash car with a hosepipe[Q43D]				

44. [Q44A][Q44B][Q44C][Q44D][Q44E][Q44F][Q44G] Do you limit how much water you use for any of these reasons? Select all that apply.

- 1 Keep electrical bill down
- 2 Keep water bill down
- 3 Keep sewer bill down
- 4 Not sure if septic system can handle wastewater
- 5 Want to conserve water to protect the resources
- 6 Other (*Specify*) [Q44F_OTHER] = OTHER VERBATIM COMMENTS
- 7 I do not limit my water use

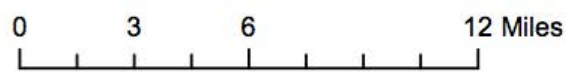
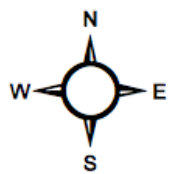
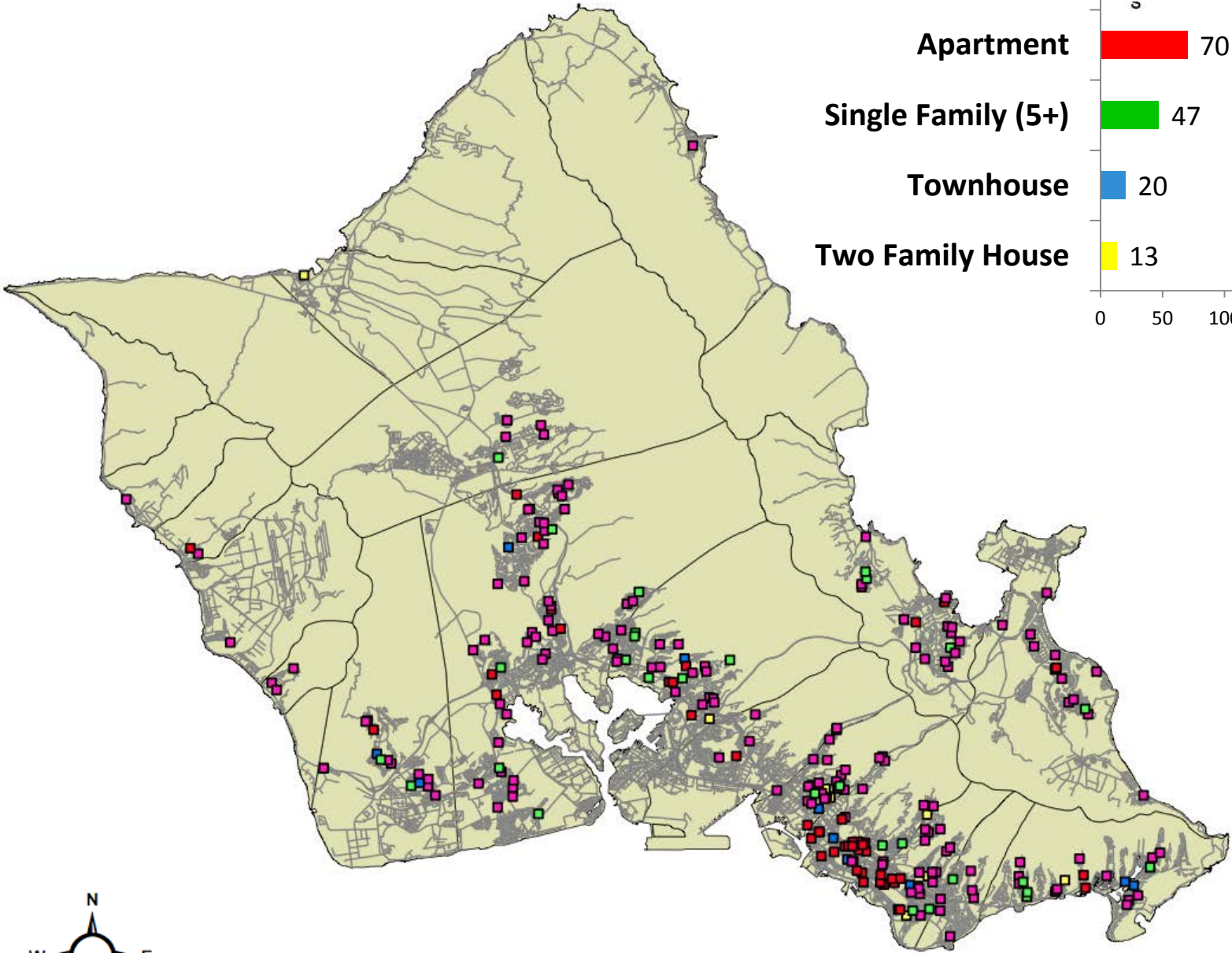
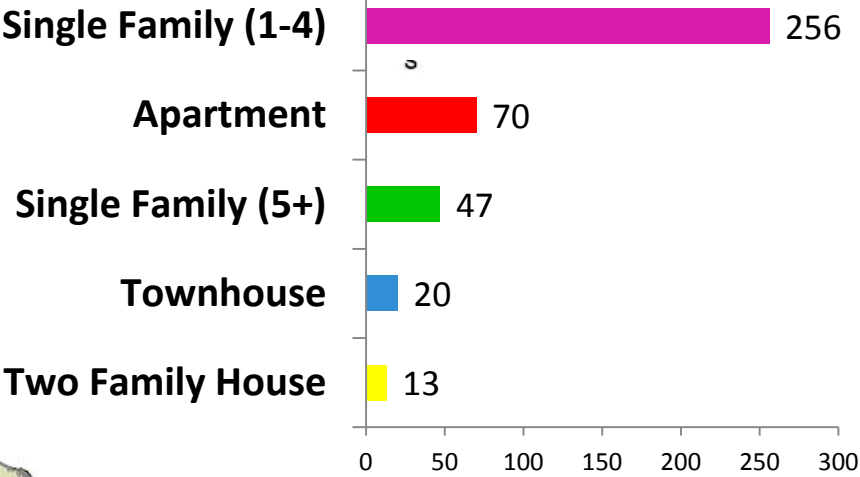
45. [Q45] How concerned are you about the future supply of Hawai'i's water?

Not At All Concerned	Neutral/ Not Sure	Slightly Concerned	Moderately Concerned	Extremely Concerned
1	2	3	4	5

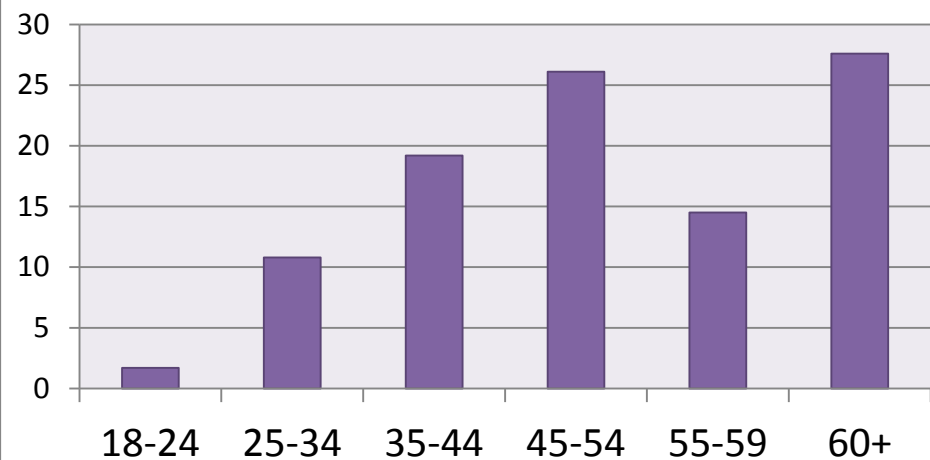
46. [Q46A][Q46B][Q46C][Q46D][Q46E][Q46F] Have you participated in any of the following programs? Select all that apply.

- 1 Mayor's Challenge to Save Water
- 2 Board of Water Supply's Annual Halawa Xeriscape Garden Plant Sale
- 3 Board of Water Supply's Rain Barrel Program
- 4 Board of Water Supply's Toilet Rebate Program
- 5 Other (*Specify*) [Q46E_OTHER] = OTHER VERBATIM COMMENTS
- 6 I have not participated in any water conservation programs

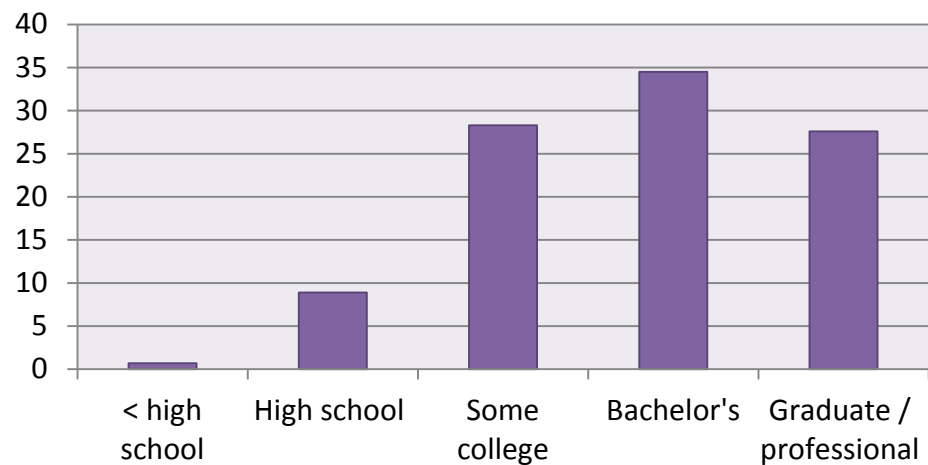
Survey respondents, n=406



Age



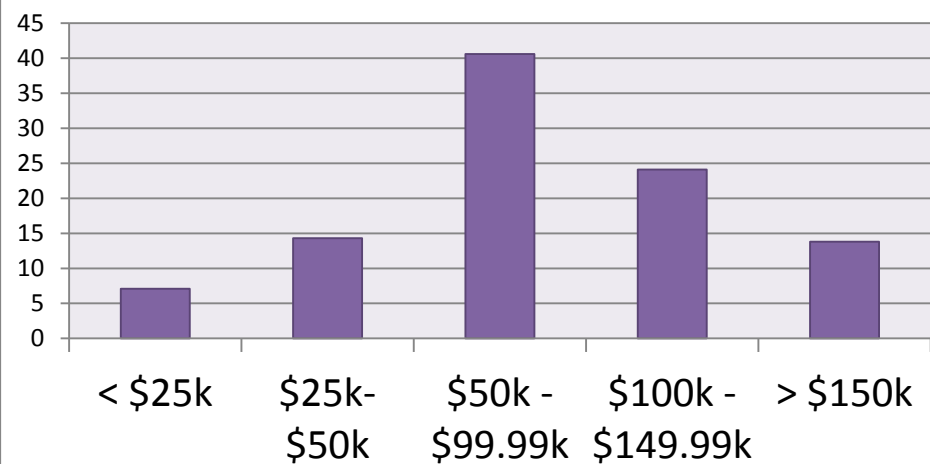
Education



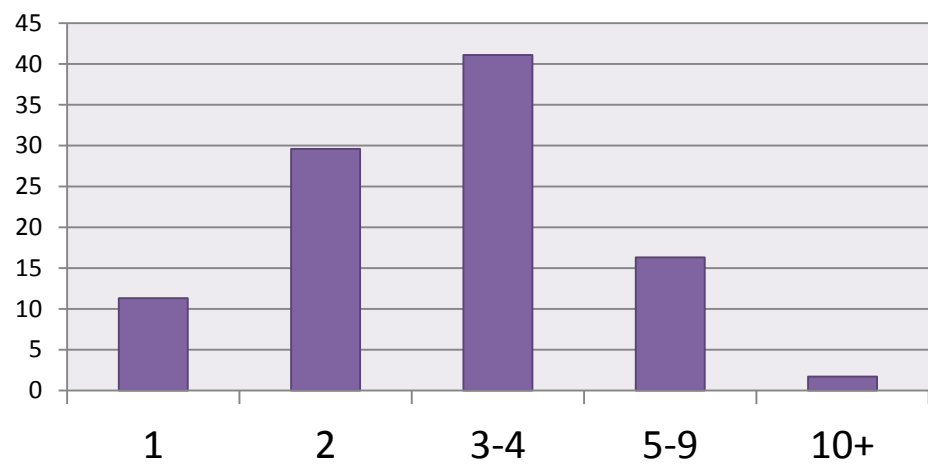
Rent
24%

Own
76%

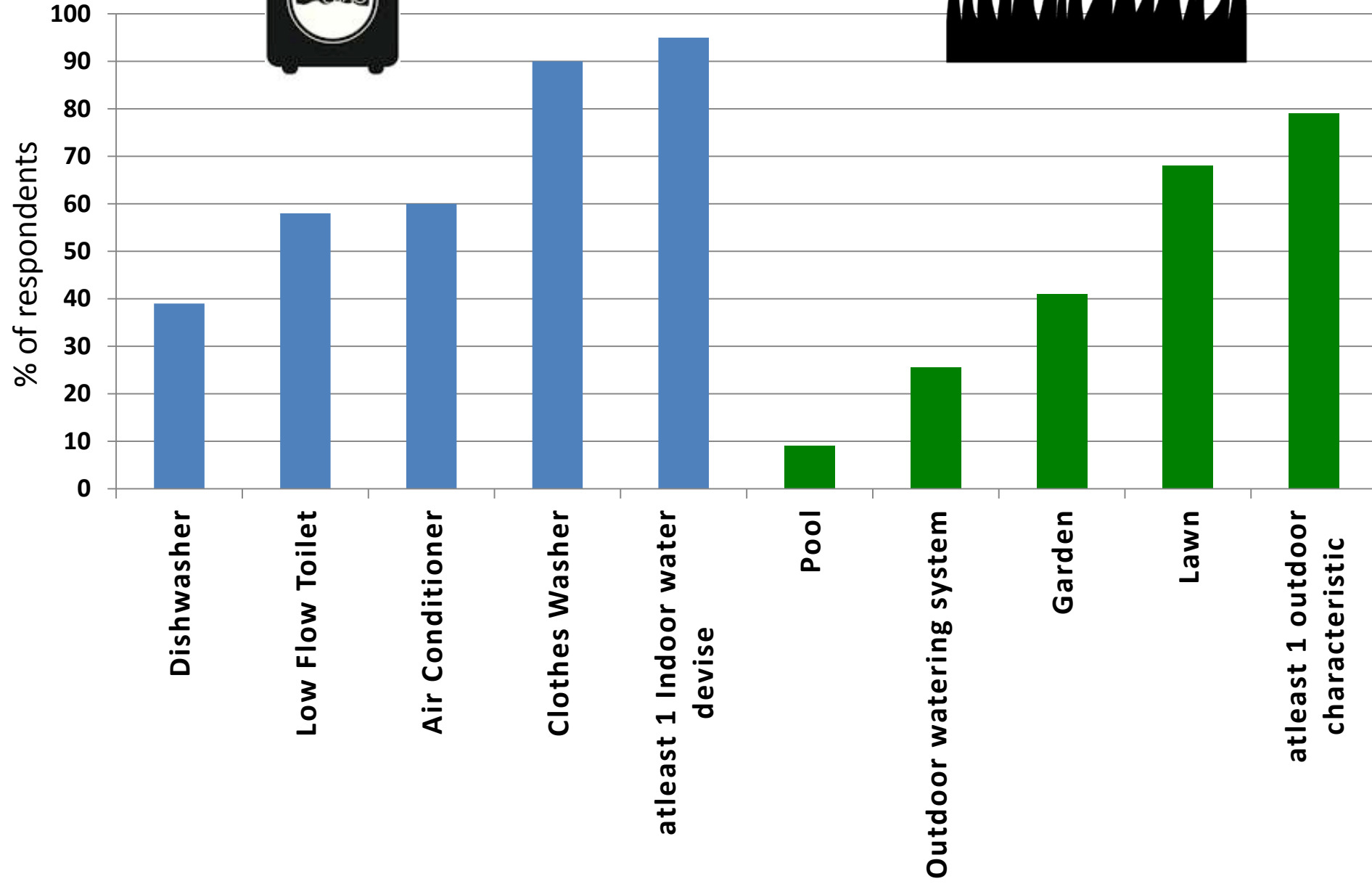
Household Income



Household size

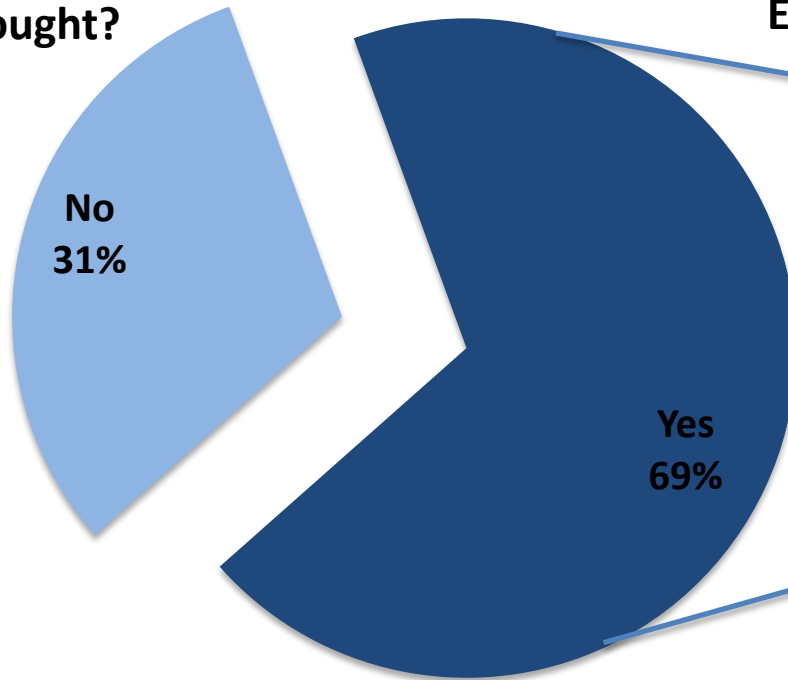


Preliminary Results

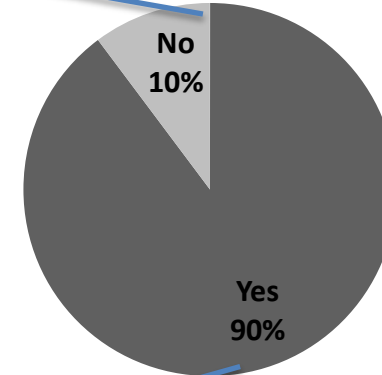


365 of households have a dishwasher, clothes washer or both

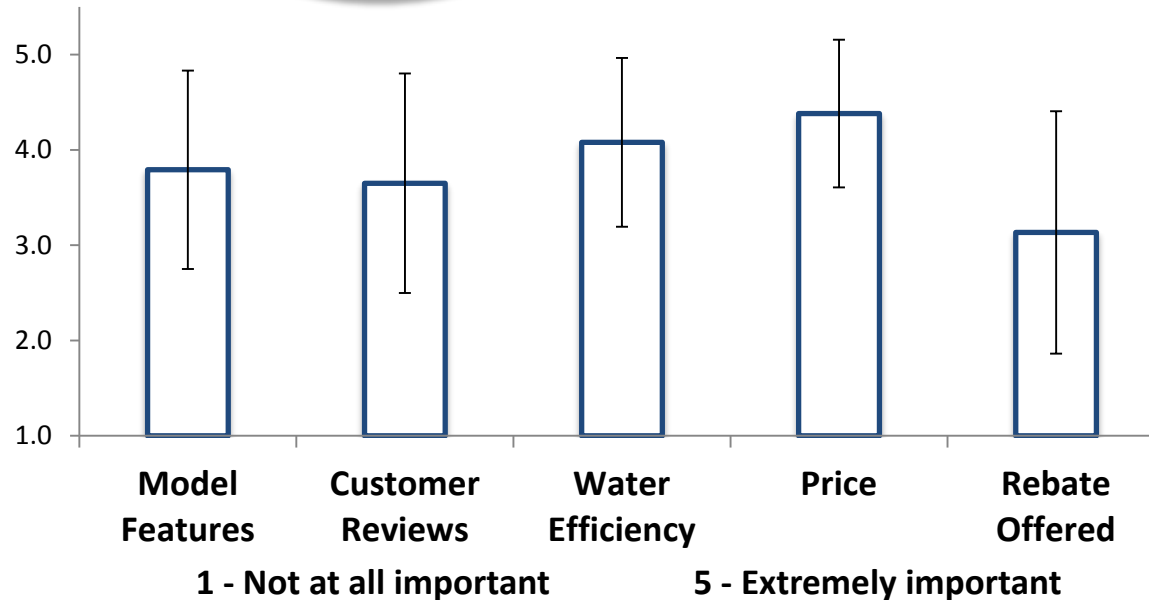
Recently bought?



Energy Star or WaterSense certified?

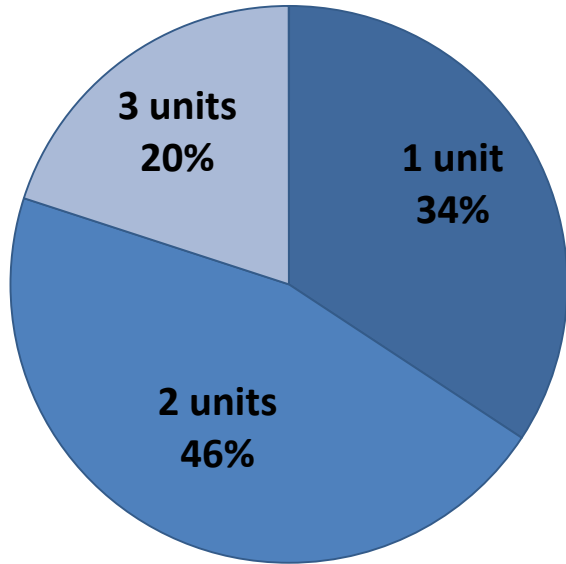


Important features

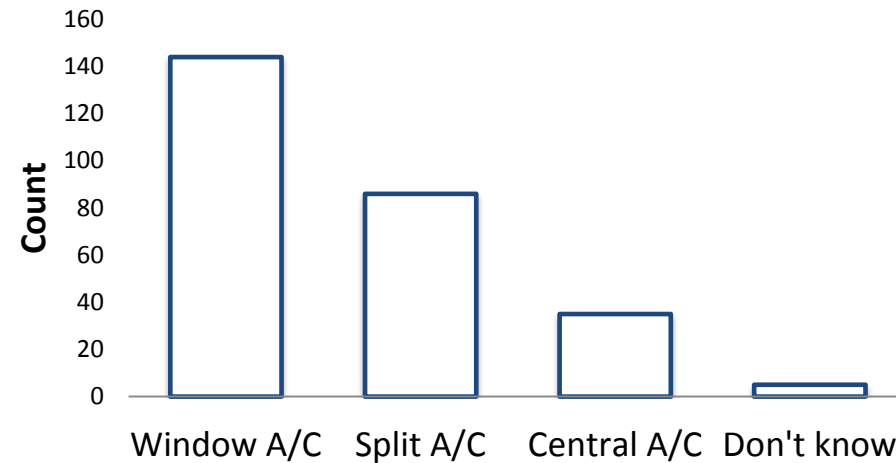


245 (60%) households have at least 1 A/C unit

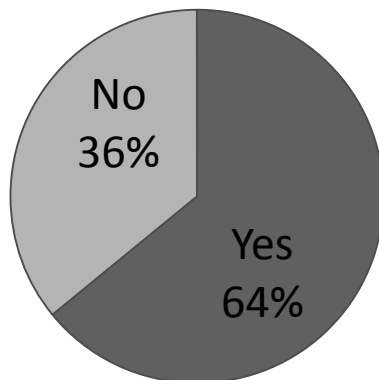
Number of A/C units per household



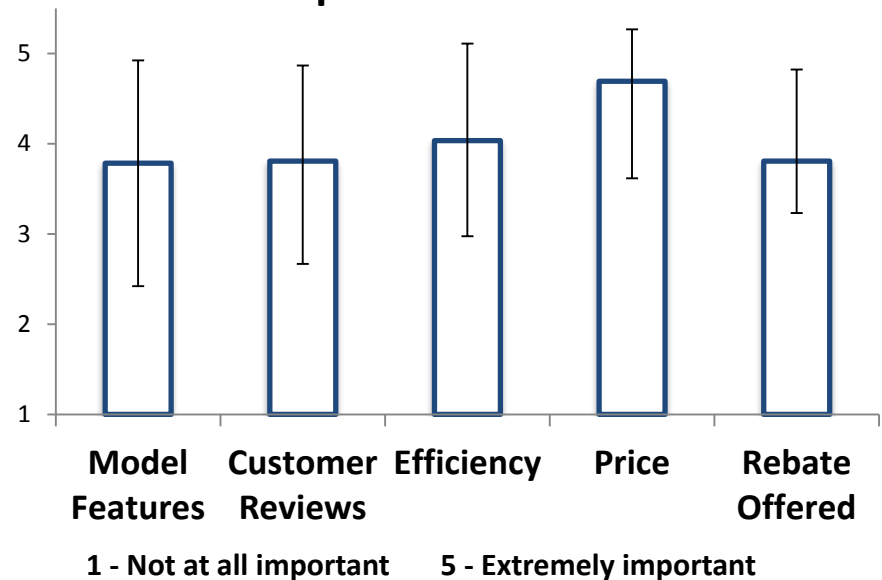
Type of A/C system



Recently purchased (< 10 yrs)

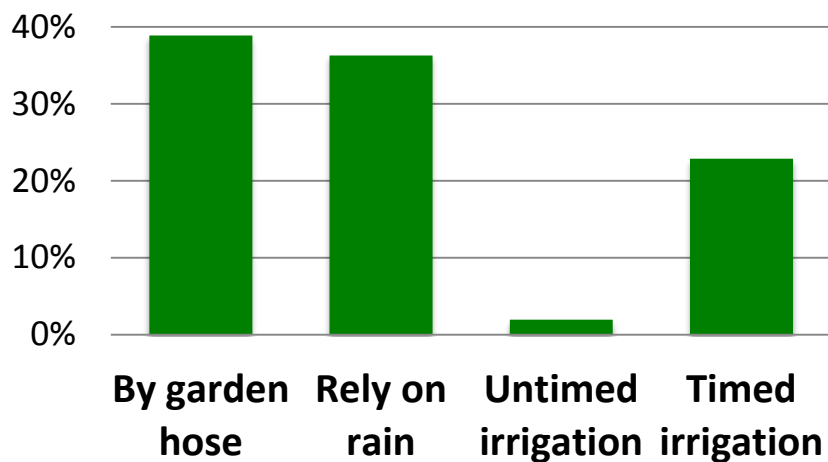


Important features



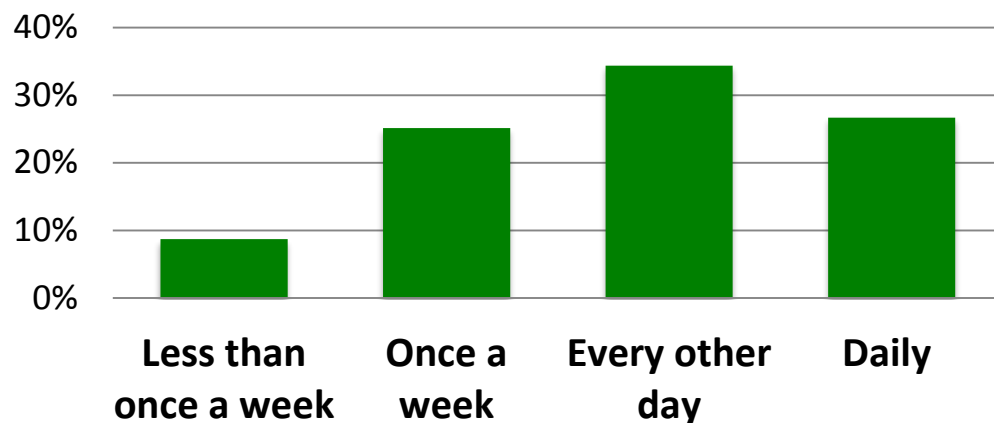
How do you prefer to water?

n=306



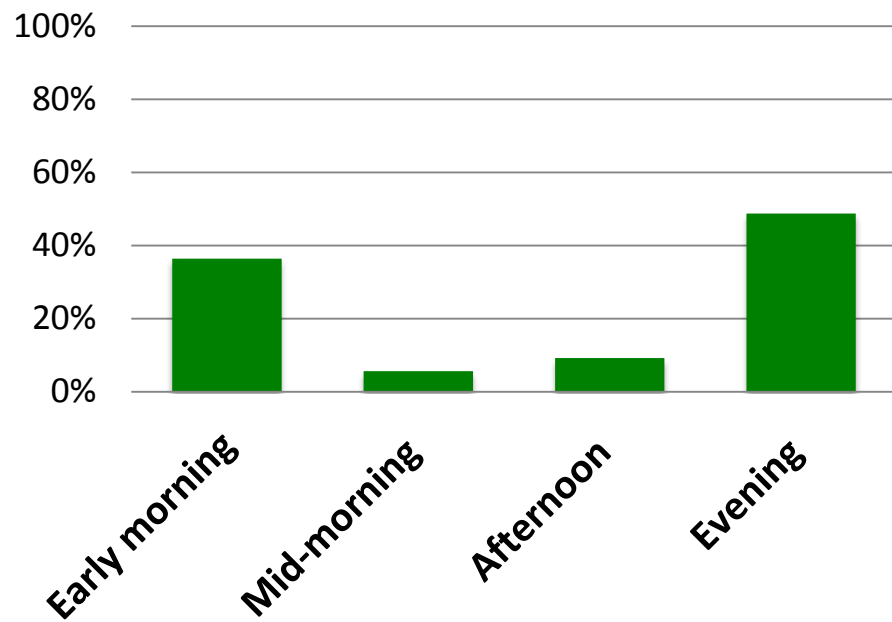
How often do you water?

n=195



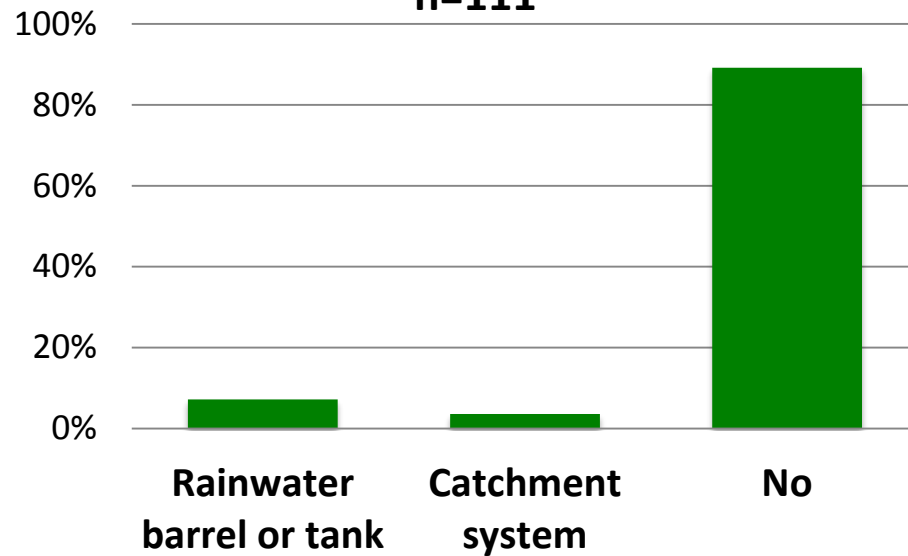
What time of day do you water?

n=195

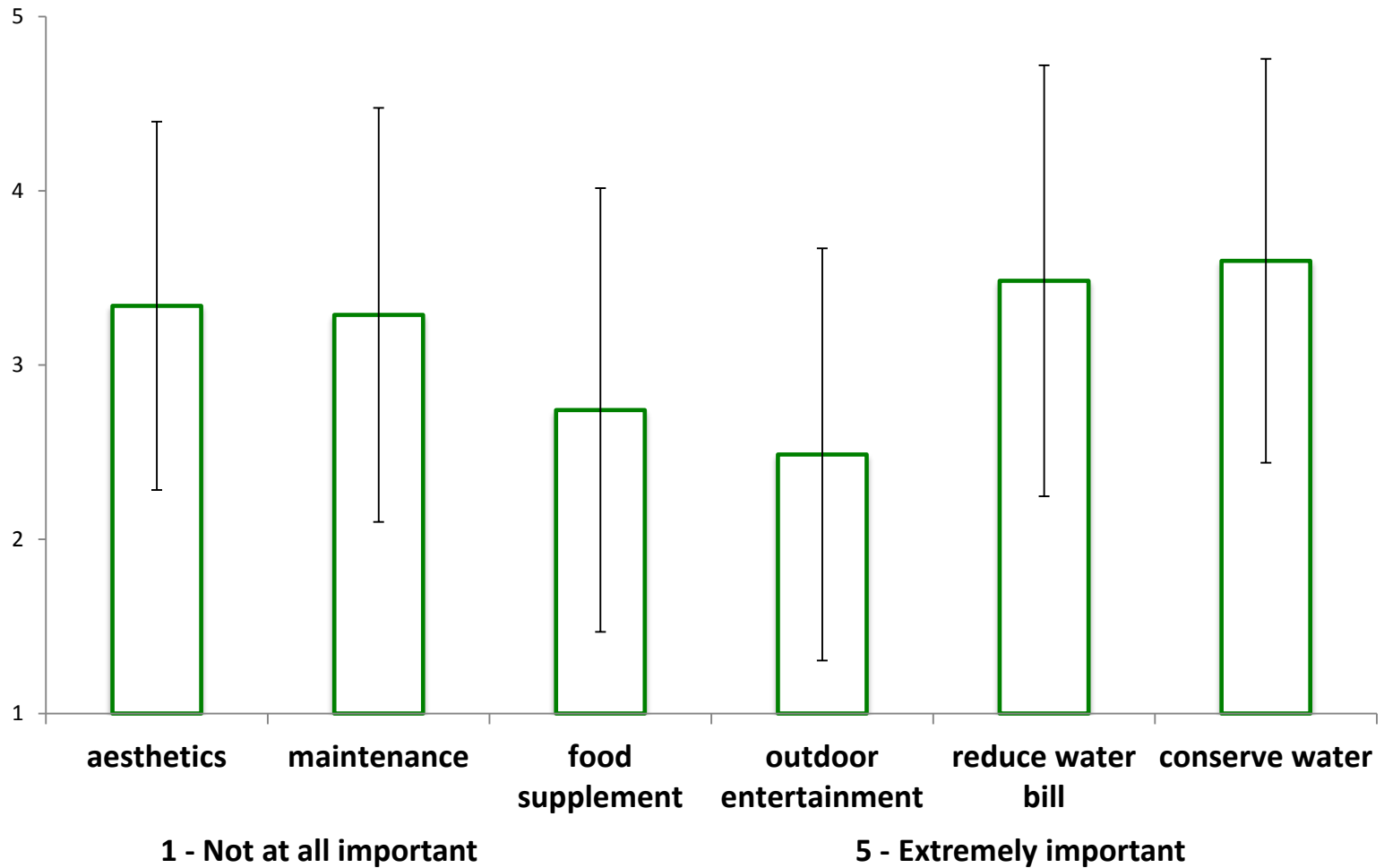


Do you use a grey water system?

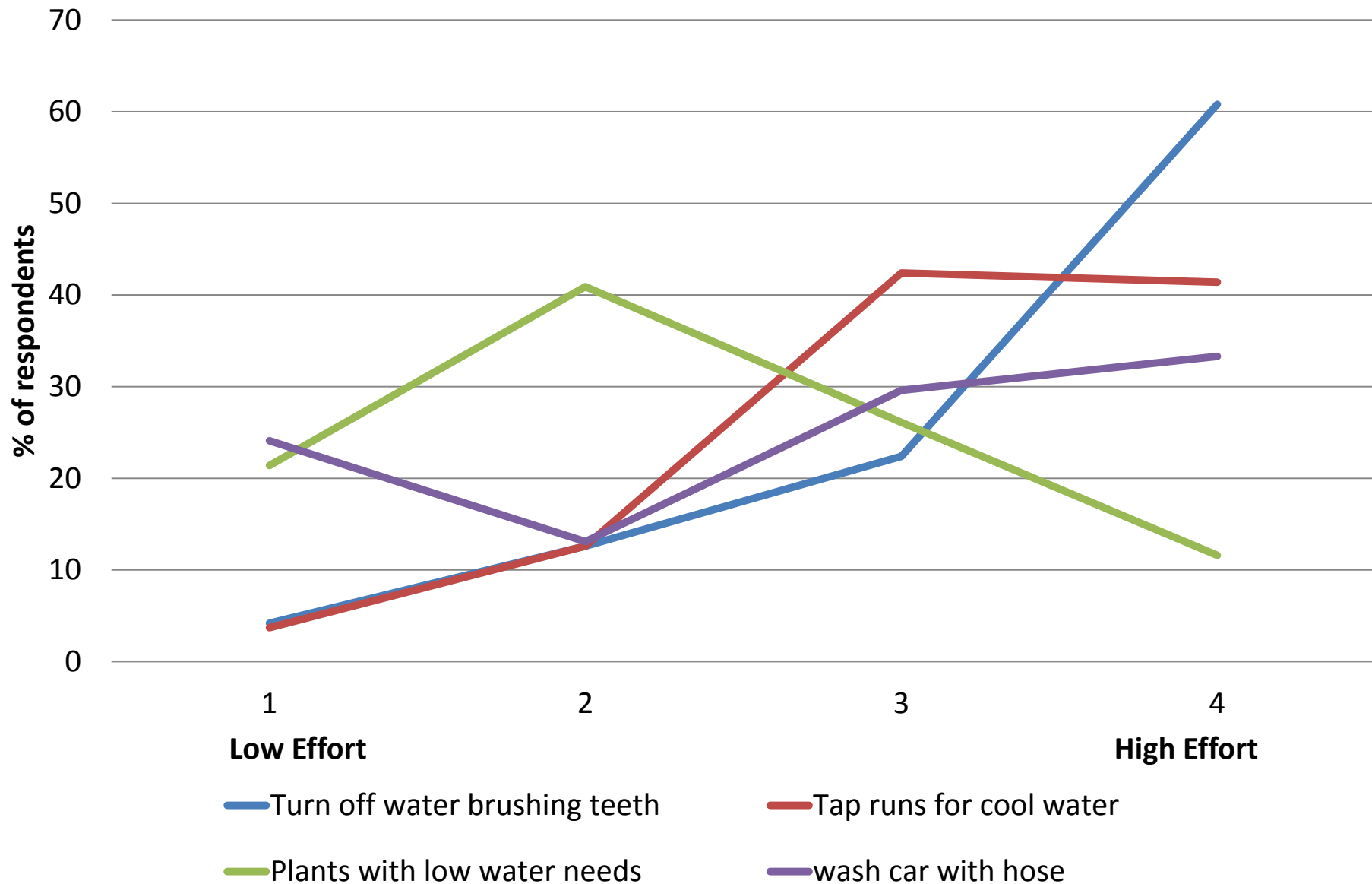
n=111



How important are the following factors influencing your choice in outdoor garden/landscape?



Water Conservation - personal effort

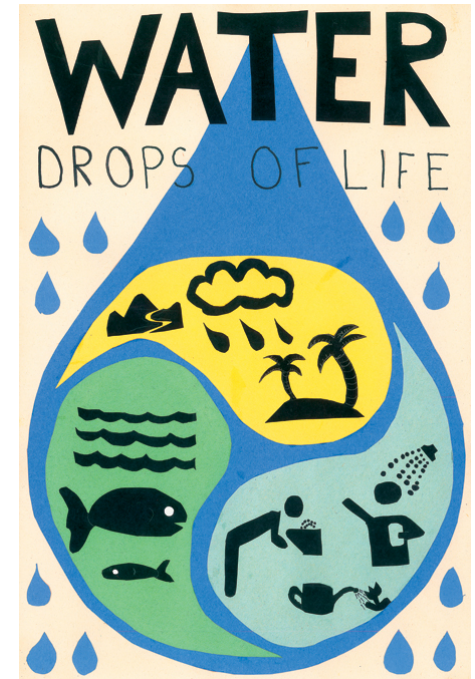
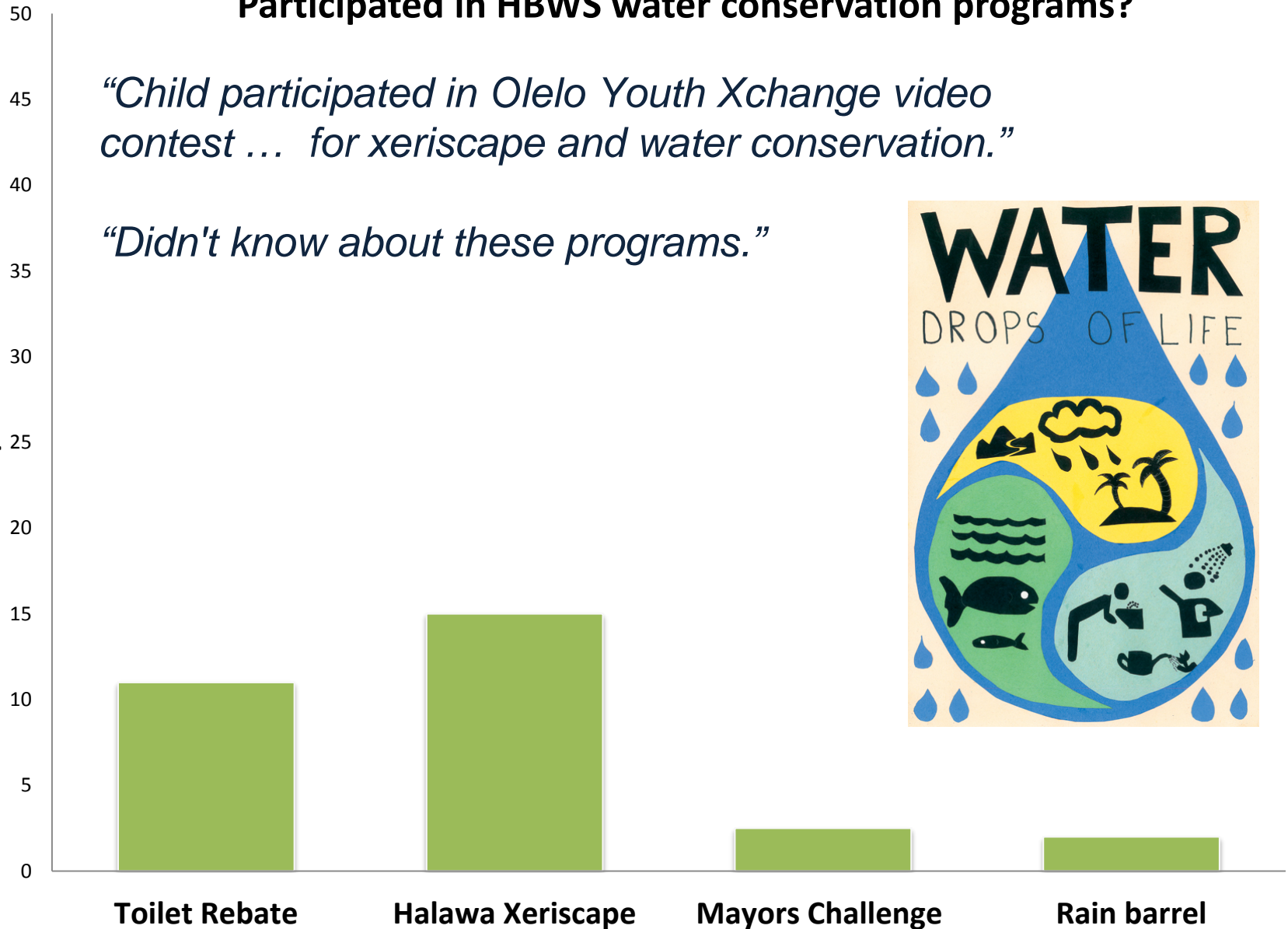


Participated in HBWS water conservation programs?

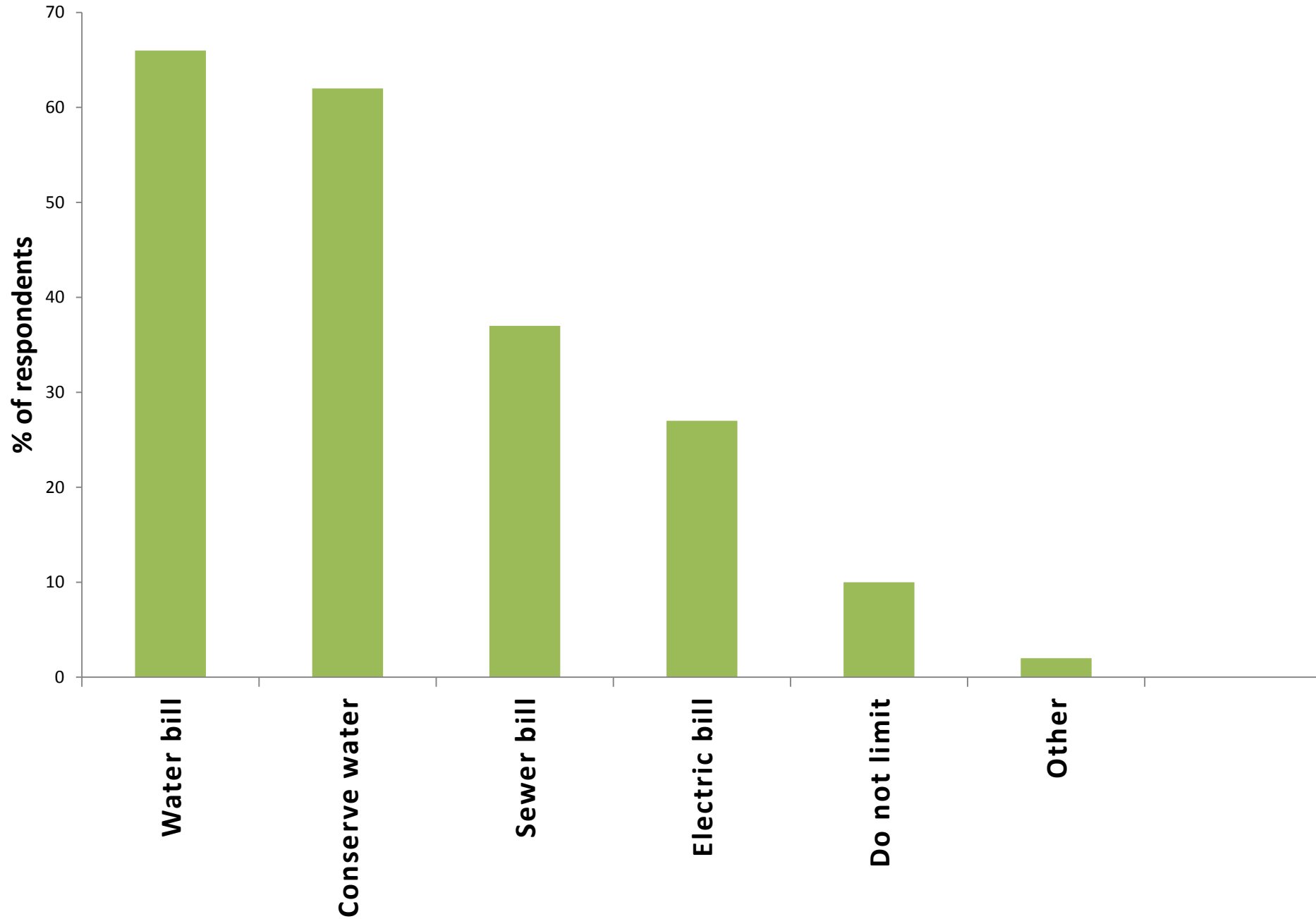
“Child participated in Olelo Youth Xchange video contest ... for xeriscape and water conservation.”

“Didn't know about these programs.”

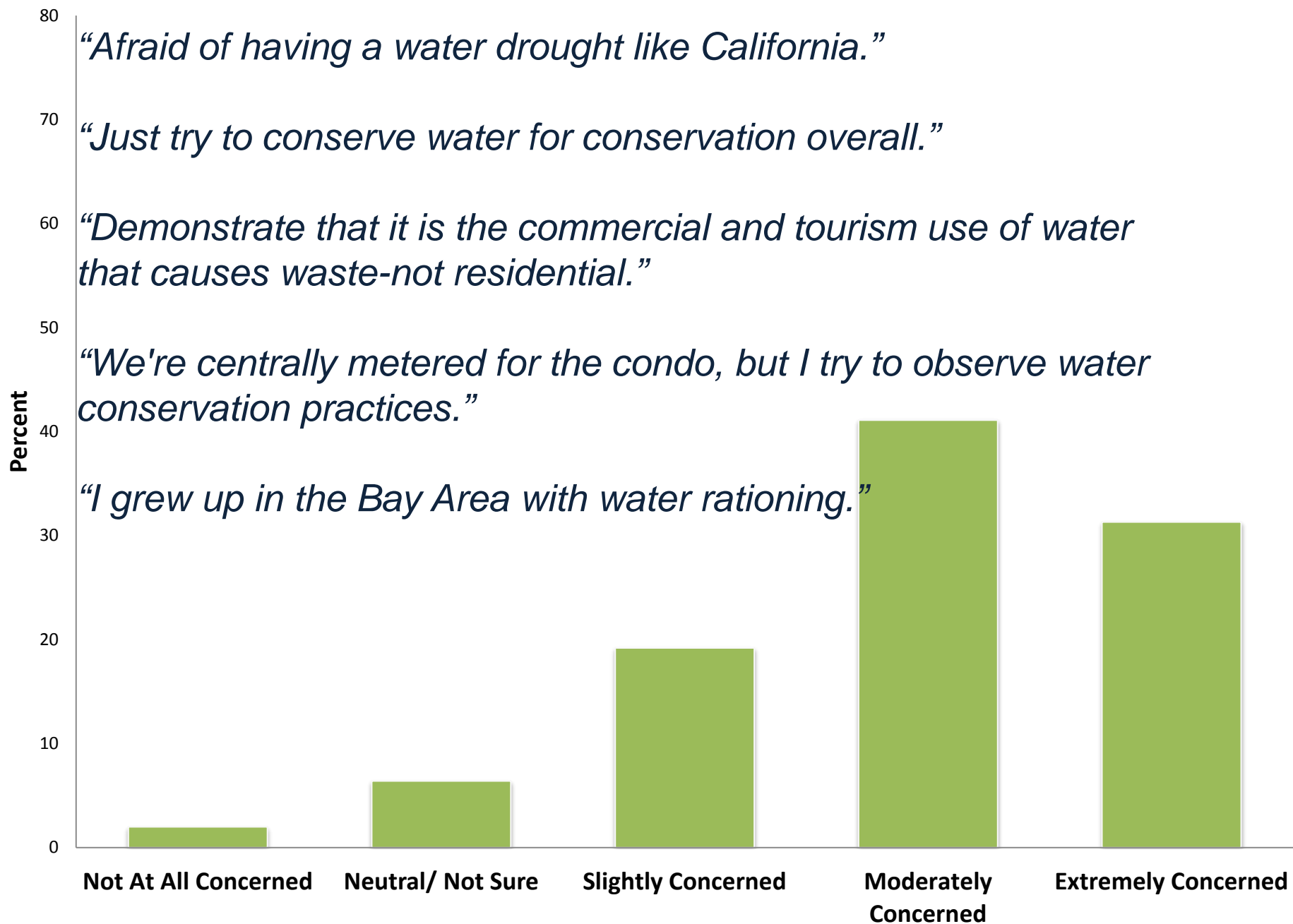
% of respondents



Do you limit how much water you use for any of these reasons?



How concerned are you about Hawaii's future water supply?



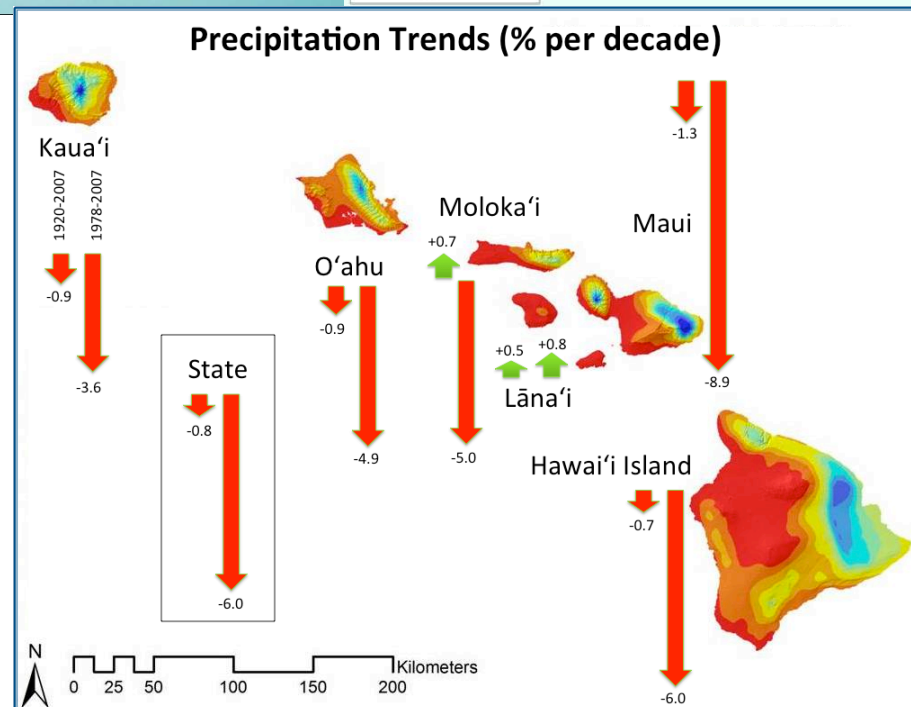
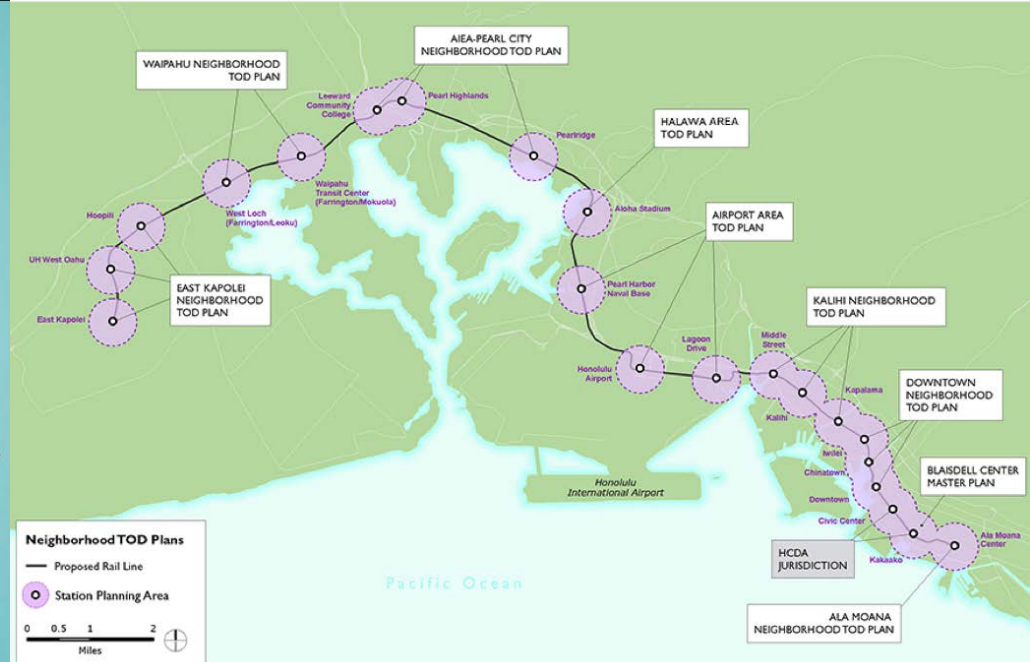
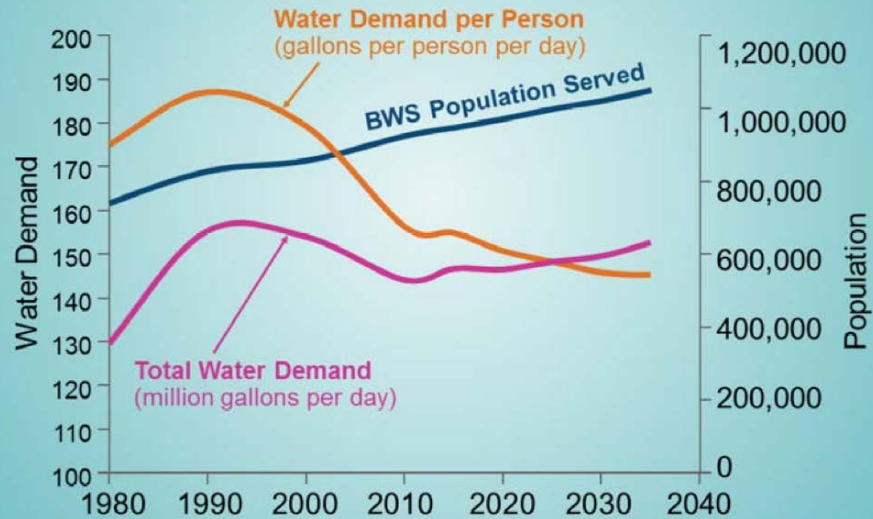
Summary

- Motivated by water efficiency
 - Price of water
- Motivated by conservation values
 - Future of water; drought
- Disconnect between values & behaviors?
- Low participation in HBWS conservation programs

Next steps...

- Examine differences based on demographics, housing characteristics, location, land tenure
- Link to Water billing data
 - Monthly water consumption patterns
 - Examine associations between behavioral and attitude variables with water use

Population Growth x Conservation = Reduced Water Demand



Images from Honolulu Board of Water Supply, City & County of Honolulu TOD Plan, and Giambelluca et al. 2011.



Mahalo

Questions?

Daniele Spirandelli
danieles@hawaii.edu