

# Coastal Residents' Perceptions of Seawater Desalination and Its Impacts on Coastal Ecosystems



Nadine Heck<sup>a</sup>, Adina Paytan<sup>a</sup>, Donald Potts<sup>a,b</sup>

<sup>a</sup> Institute of Marine Sciences, <sup>b</sup> Ecology and Evolutionary Biology, University of California, Santa Cruz



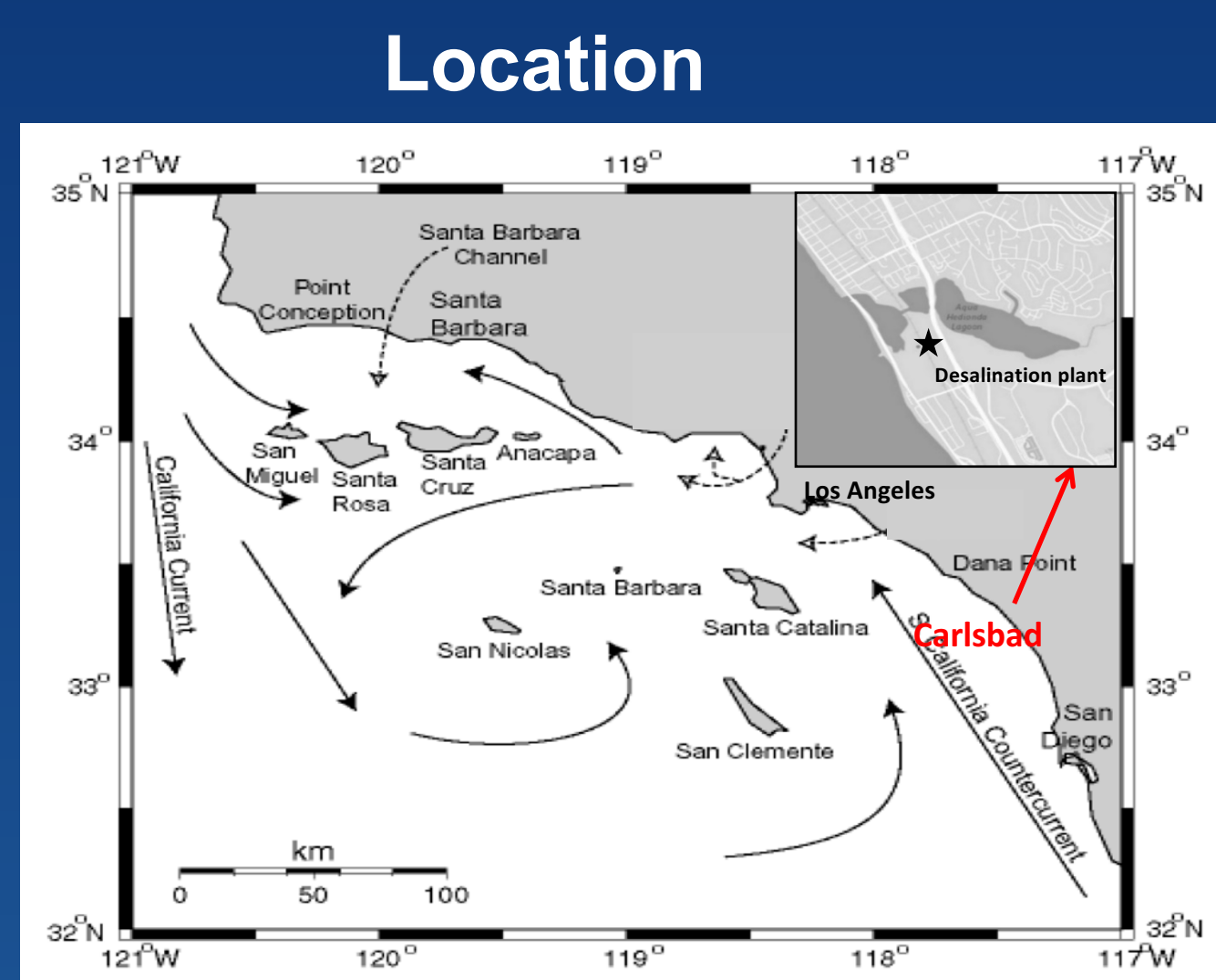
## Background and Aims

- Seawater desalination is promoted as being independent of climate and a reliable source of water during droughts
- California has the highest number of proposed desalination plants in the U.S.
- Economic and environmental concerns remain
- Potential impacts on marine ecosystem include water intake and brine discharge
- Local community support or resistance can be critical for implementing new plants
- First study of public literacy and attitudes towards a local desalination plant in a small coastal community

## Research Objectives

- Create baselines for social indicators: awareness of plant and brine discharge; self-assessed and factual knowledge about impacts on marine areas; beliefs about plant outcomes; attitude towards seawater desalination plant
- Identify variables that increase public awareness and knowledge about brine discharge and impacts on the ocean
- Identify variables shaping local attitudes

## Case study site: Carlsbad California



### Carlsbad

- **Population:** 112,299
- **Community profile:** median age 41.7, median income \$87,416, bachelor's degree or higher 51.9%, white 82.8%
- **Marine environment:** part of Southern California Bight
- **Coast adjacent to plant:** 50-70 m wide beaches backed by 12-24 m marine terrace bluffs

### Desalination Plant

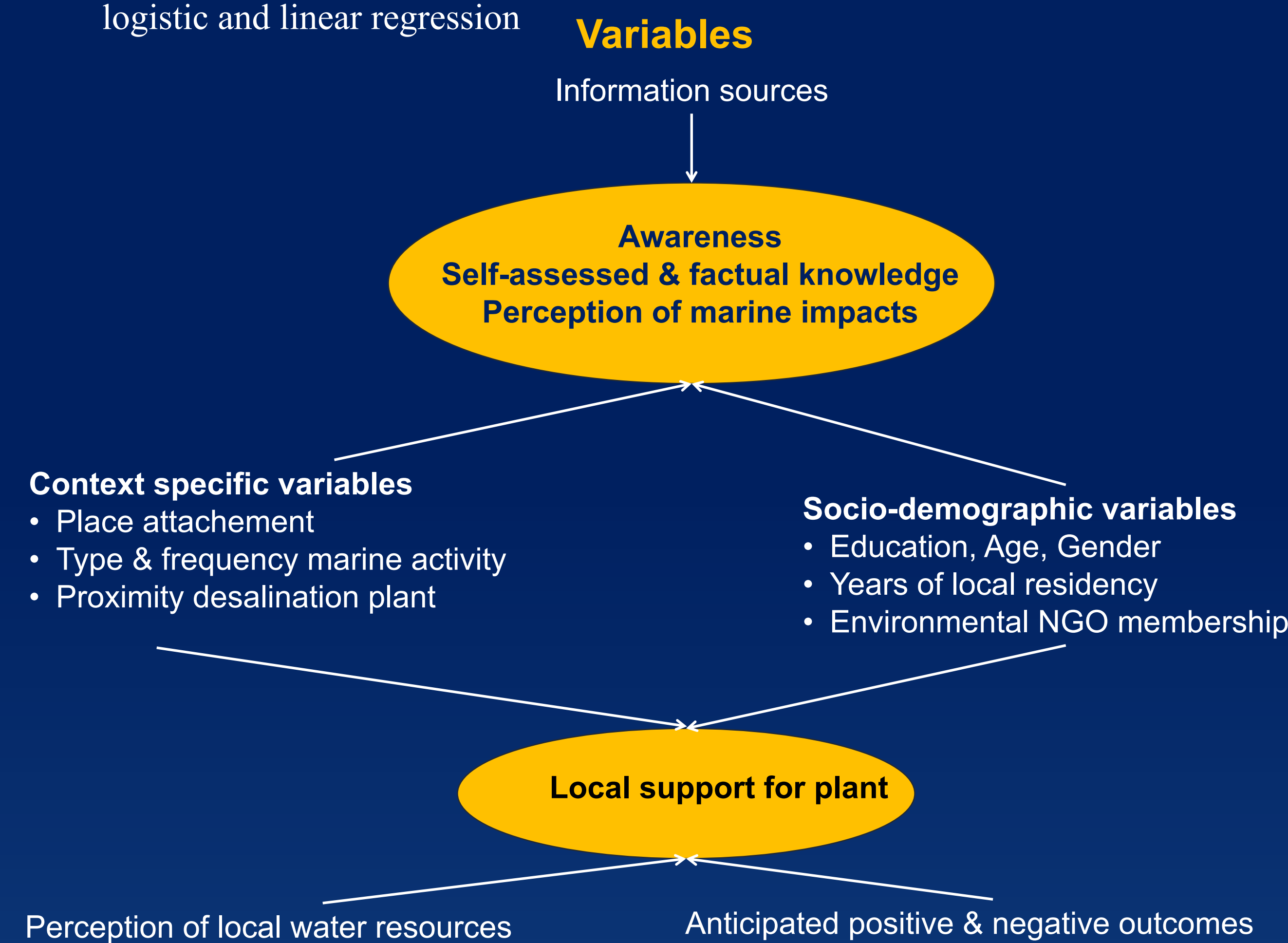
- Desalination increases local supplies to 26%
- Privately owned (Poseidon Resources)
- Water purchased by San Diego County Water Authority (30 year contract)
- Total Costs: \$984 million
- Annual Operation & Maintenance: \$50 - \$54 million
- Intake: ~300 million gallon water per day (mgd)
- Outputs: ~50 mgd drinking water, ~50mgd brine
- Dilution: ~200 mgd ocean water to dilute brine before discharge

### Aerial overview



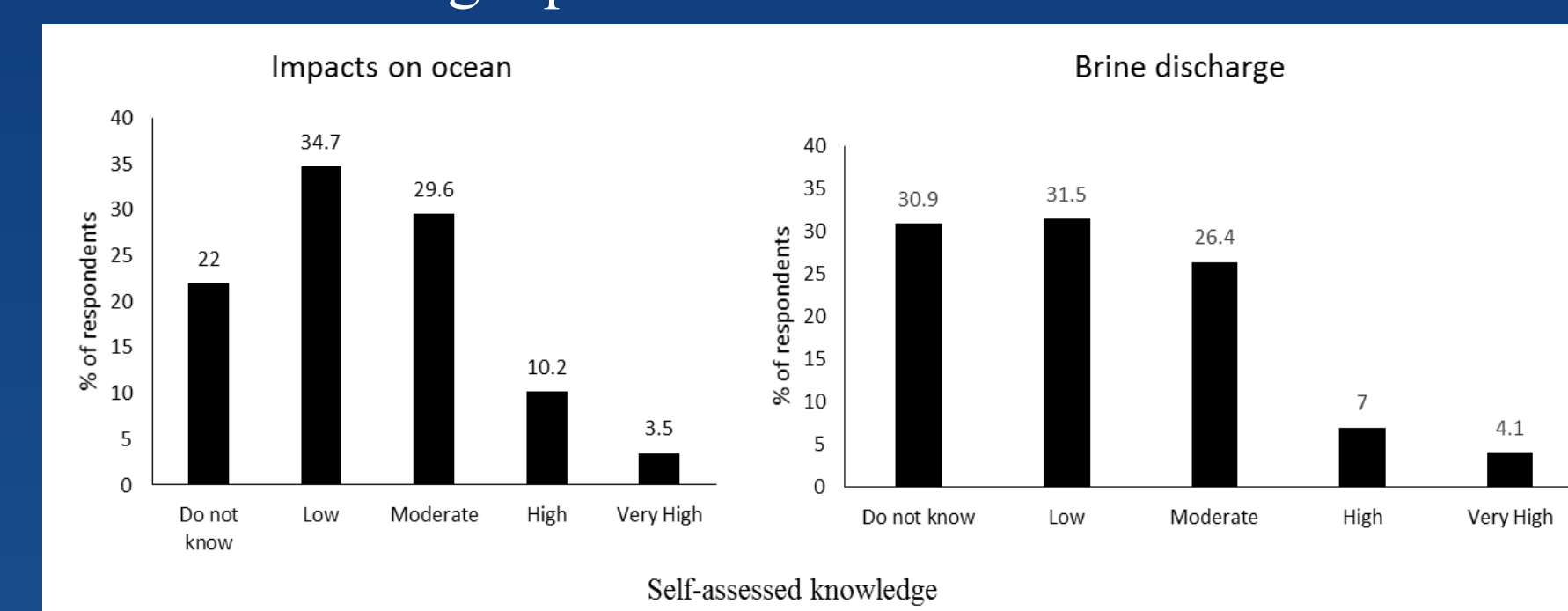
## Methods

- Questionnaire-based mail surveys in March and May 2015
- Administered to 1,500 residents randomly selected from postal records
- Return rate 330 (25%, 159 undeliverable)
- Data analysis with SPSS 17: Descriptive statistics, Spearman correlation, Binary logistic and linear regression



## Public Literacy: Awareness and Knowledge

- 51.3 % local residents unaware of brine discharge
- Low self-assessed and factual knowledge ( $r_s=0.521$ ,  $p<0.01$ ); factual knowledge assessed via 10 knowledge questions



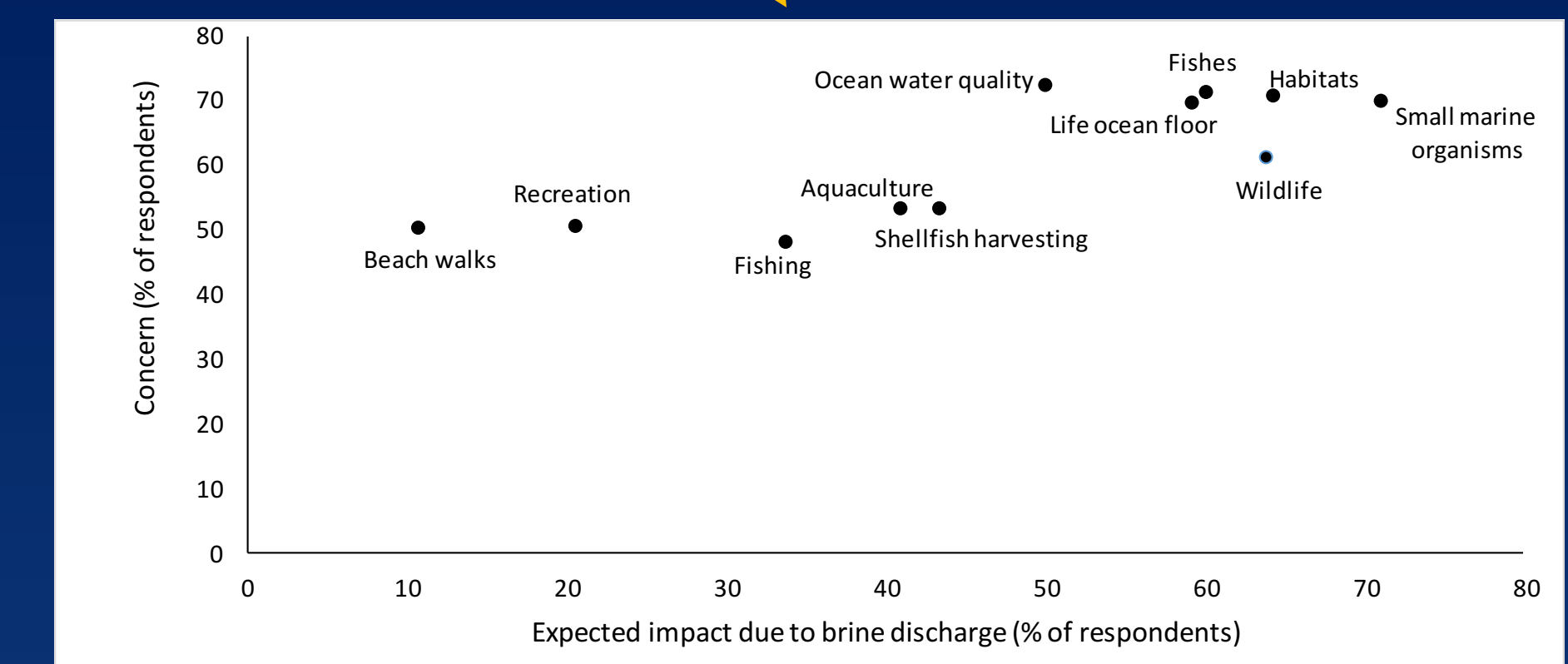
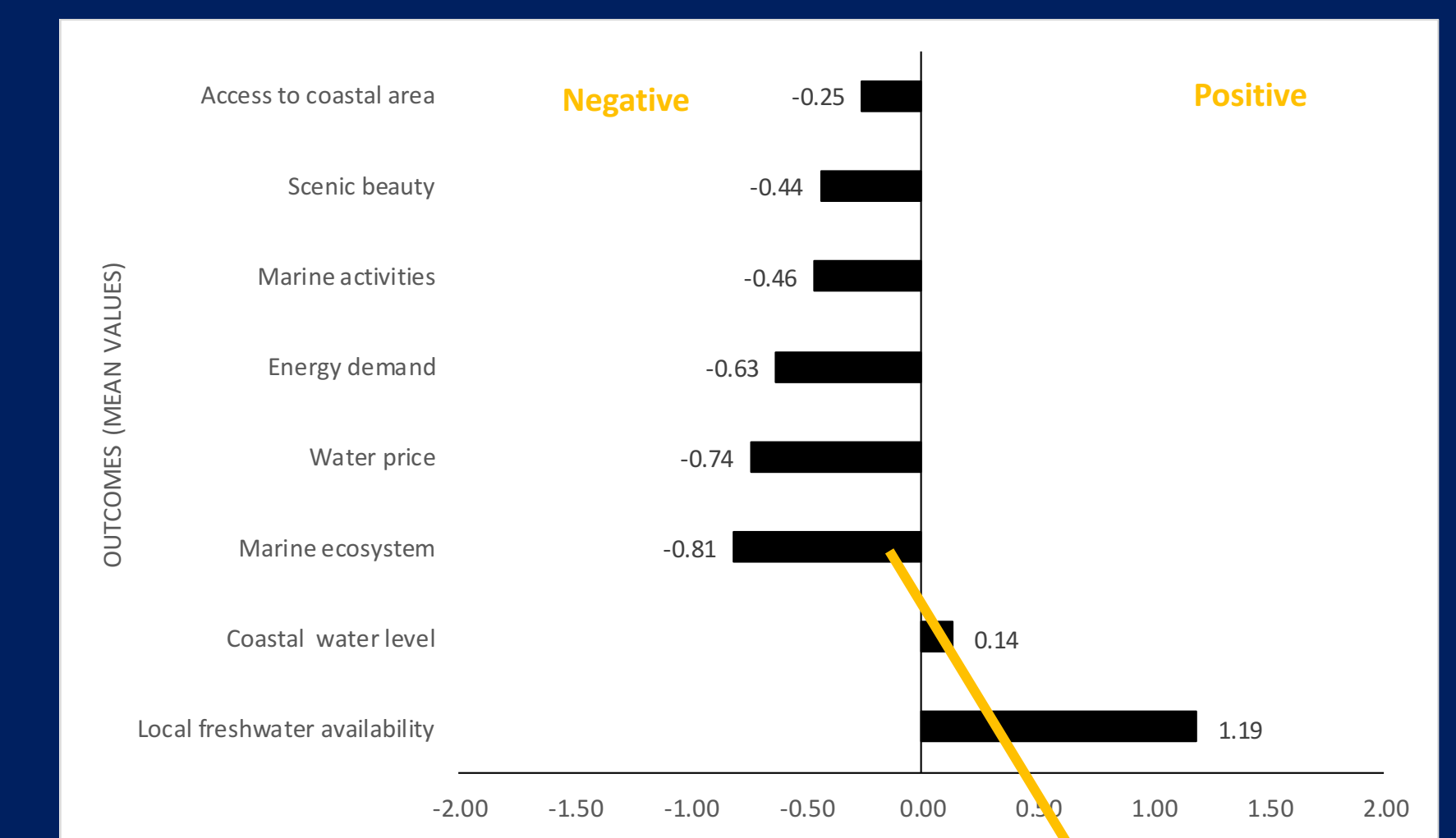
- Gender, engagement in marine activities and select information sources significantly influence knowledge
- High factual knowledge negatively correlated with support for plant ( $p<0.01$ )

	Self-assessed knowledge <sup>2</sup>	Factual knowledge (# of correct answers)
<b>Socio-demographics</b>		
Gender	-.277**	-.270**
Education	-.032	.015
Age	.108	-.098
Years in Carlsbad	.234**	.060
Member NGO	-.159**	.102
<b>Situation-specific variables</b>		
Frequency ocean use	.170**	.197**
Place attachment	-.181**	-0.021
<b>Information use</b>		
TV	.350**	.059
Newspaper	.236**	.197**
Internet	.322**	.234**
Radio	.301**	.156**
Public hearings	.333**	.074
Visit plant	.294**	.060
Social media	.045	.059
Family or friends	.141*	.094
Scientist	-.352**	.181**
Water authority	.364**	.107
Environmental NGO	.301**	.194**
Pro-desalination group	.310**	.086
Anti-desalination group	.312**	.126*
Water industry	.343**	.131*
Government agency	.289**	.195**

## Beliefs and Attitudes

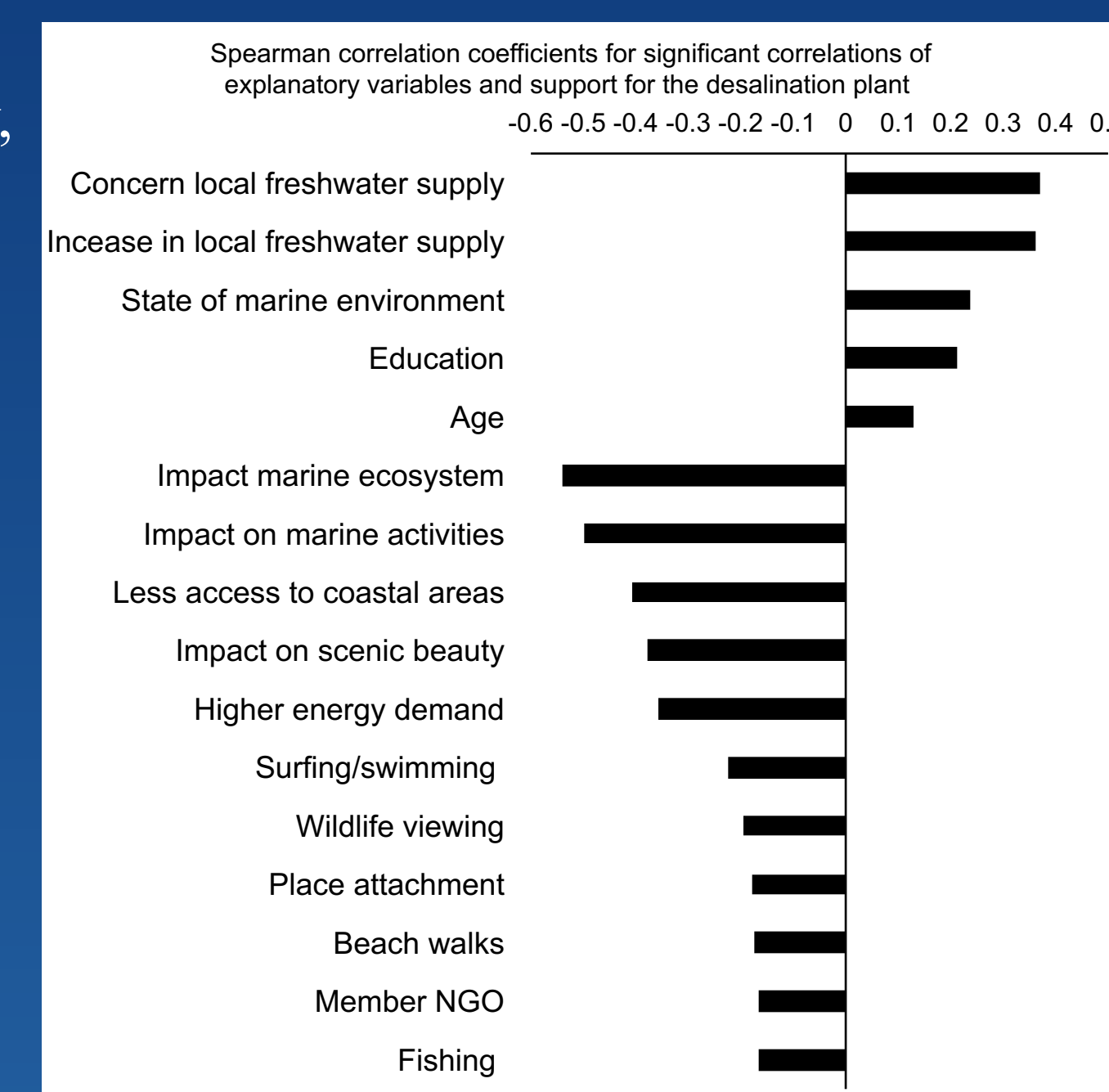
Residents expect:

- Positive and negative social and environmental outcomes
- Mainly impacts on marine ecosystem and less on marine activities, but are concerned about negative impacts on both



% of respondents that expect negative or very negative impact  
% of respondents that were somewhat to extremely concerned

- Perceptions about water resources and socio-demographic factors (education, age) were positively correlated with support
- Anticipated negative environmental & social outcomes, membership in environmental NGO, and use of and attachment to marine areas were negatively correlated
- Gender, length of local residency, proximity to plant were not correlated with support



## Conclusions

- Literacy of coastal resident about desalination and impacts on marine ecosystem is very low
- Both knowledge and attitudes are shaped by socio-demographic and context-specific variables (ocean use, place attachment)
- Proximity of residence to desalination plant was not correlated with attitude → No NIMBY effect ("Not in my Backyard")
- Environmental context (availability of freshwater) increases support for seawater desalination, but is not the only shaping factor
- Need to understand if attitudes remain stable or how and why attitudes change over time

## Context of study

Part of Interdisciplinary Coastal SEES research project  
<http://desalinationucsc.weebly.com/>