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Resident & Tourist Preferences for Stormwater Management Strategies in Oahu with a Benefit-Cost Analysis

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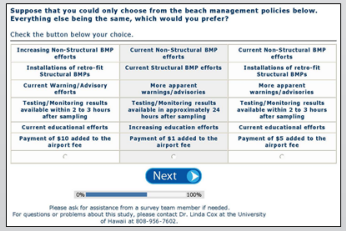
Introduction

- Hawaii's world famous marine environments drive tourism, which was 14.8% of GSP in 2009, and half of all tourism dollars spent on the island of Oahu (HTA, 2010).
- Oahu's population density (1587 per mi2) and tourist popularity threaten beach quality and thus economic vitality. 68 "Brown Water Advisory" days for the entire state have been issued since Sept. 2005 (Water Quality at Hawaii Beaches, 2011).
- Brown water advisories and stormwater pollution can be mitigated by various storm water management policies, but funding is a major obstacle to their implementation.
- Our goal is to ascertain and evaluate the Willingness to Pay for each policy and apply it to a Benefit-Cost Analysis.

Survey & Choice Experiment Design

- To ascertain opinion on beach pollution and monitoring policies, this study used a choice-based conjoint analysis within a survey of both residents and tourists in Oahu, HI.
- The survey was implemented as an in-person interview (CAPI) in Sept. & Oct. 2009 by a professional survey firm.
- Each respondent choice experiment contained 10 randomized choice sets with 3 alternatives per set.



Stormwater Policies (attributes) included:

- Each policy attribute contained 2 levels, a status quo level and an augmented level.
- Nonstructural BMP's: bolster stormwater policy enforcement and existing BMP's.
- Structural BMP's: improve installations that slow, decrease the volume of, or filter stormwater runoff.
- Advisories: Develop and implement a more apparent warning and advisory system.
- Monitoring: New tests that yield results 2-3 hours after sampling
- Education: Implement more educational efforts to reduce stormwater pollution.
- Payment Vehicle: Increases in the annual household wastewater fee and the Honolulu Airport fee were considered by residents and tourists, respectively.

Theoretical Model

- Choice experiments are based on Lancaster's approach that utility is derived from the attributes of goods and services modeled within a Random Utility framework.
- We use a mixed logit model to analyze attribute effects on alternative selection within a choice set and test for parameter heterogeneity (Train, 2009).

$$P_{ijt} = \int \frac{\exp(X_{ijt}\beta)}{\sum_{k=1}^{J}\exp(X_{ikt}\beta)} h(\beta)d(\beta)$$

- Marginal values (i.e. Willingness to Pay) can be calculated by dividing the parameter estimate of an attribute and that of the payment vehicle.

Sample Summary

Variable	Tourists	Tourist Average[a]	Residents	Resident Average[b]
Responses	373		371	
Household Income	$75,932		$56,930	$77,662
Female	48.3%	50.6%	47.1%	49.4%
Bachelor's Degree or More	65.4%		44.4%	30.7%
Days on Oahu	8.29	7.37%		
Age 55 or older	37.9%		12.4%	24.9%

[a]Based on the Hawaii Tourism Authority 2010 Annual Report
[b]Based on the US Census' American Community Survey, 2010

Mixed Logit Estimates

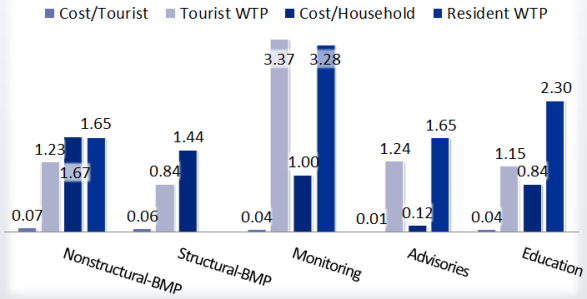
Attribute	Tourist Estimate	Std. Error	Resident Estimate	Std. Error
Nonstructural BMPs	.251**	.042	.219**	.043
Structural BMPs	.172	.043	.056**	.043
Advisories	.254**	.042	.219**	.043
Monitoring	.689**	.044	.436**	.044
Education	.235**	.041	.306**	.042
Airport/Wastewater Fee	-.205**	.016	-.133**	.011
Airport/Wastewater Fee Standard Dev.	.257**	.016	.179**	.010

**represents statistical significance at the .01 level

Policy Benefit-Cost Analysis

- The cost of each stormwater policy was based on expert opinion from interviews of several directors within Oahu's government. We assume expenses were split evenly among tourists and residents.
- Cost per resident was based on 311,047 occupied housing units on Oahu (US Census, 2010). Cost per tourist was based on 6,982,425 visitors arrivals per year (HTA, 2010).

Tourist & Resident Benefits & Costs Per Policy



Results/Conclusion

- All attributes were statistically significant in predicting respondent choice except for Structural BMP's among residents.
- We find significant heterogeneity in resident and tourist reaction to changes in the required wastewater and airport fee, respectively.
- The cost to implement all 5 policies among tourists and the 4 significant policies of residents is $.22 and $3.63, respectively.
- The total WTP to implement 5 policies among tourists and 4 policies among residents is $7.83 and $8.91, respectively.
- Relative to the cost of implementation, both residents and tourists greatly value improved monitoring processes that provide more timely information, followed by improved advisory information.
- Nonstructural-BMP's was prohibitively expensive compared to the WTP among residents
- Tourists only value education half as much as residents.

Selected References

- Hawaii Tourism Authority. (2010). Annual Report to the Hawai'i State Legislature. Honolulu: Hawaii Tourism Authority.
- Train, K. (2009). Discrete Choice Methods with Simulation (2nd ed.). New York City: Cambridge University Press.
- Water Quality at Hawaii Beaches. (2011, 12 10). Retrieved 12 10, 2011, from Beachwatch.org: http://www.beachwatch.org/hawaii

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