

Lake Michigan Stakeholders' Perceptions of Coastal Risk



RESEARCH QUESTIONS

What are the differences in perceptions of coastal risks and hazards in Lake Michigan communities?
What are Lake Michigan stakeholders' motivations for coastal habitat stewardship?

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WHY STUDY COASTAL RISK?

Although agencies and programs exist to generally guide coastal management in Michigan, these institutions are not officially considered active regulatory bodies. As a result, Michigan's coastal communities have the responsibility of managing for a naturally dynamic and constantly changing system. If we can understand stakeholders' perceptions of risk and motivations for management, we can create a foundation of evidence-based best practices to assist community decision-making. Enhancing a coastal community's resilience capacity will help ensure the community will be sustained in the future, especially with the uncertainty of environmental change on the Great Lakes. Relating community members' perceptions of coastal risk to resilience policy (as a proxy for behavior) will provide us with more insight for this area of study.

COASTAL RISKS

- Increases in extreme storms
- Increases in precipitation
- More precipitation as rain than snow
- Reduced ice cover on the Great Lakes
- More flooding events with the risk of coastal erosion
- Increases in extreme temperatures

STUDY METHODS

Coastal communities were identified based on their county, population size, shoreline type, and presence of a coastal resiliency program or policy. A total of eight communities were chosen (Allegan County: City of Douglas, Saugatuck City, and Saugatuck Township; Ottawa County: Ferrysburg City, Grand Haven City, and Grand Haven Charter Township; Muskegon County: City of Muskegon and City of Norton Shores). Four resident types were also surveyed within each community: (1) "Lake Residents" owned land parcels immediately adjacent to Lake Michigan, (2) "Near-lake Residents" owned land parcels within a quarter-mile from Lake Michigan, not including Lake Residents, (3) "Inland Residents" owned land parcels more than a quarter-mile from Lake Michigan, and (4) "Municipal Officials" were both elected and appointed municipal officials and staff people. Lake, Near-lake, and Inland Residents were mailed four invitations (letter, postcard, letter, postcard) to participate in the online Qualtrics survey using a modified four-wave tailored design methodology.

SOME KEY FINDINGS

- Inland Residents are less concerned about coastal risk
- Previous experiences matter
- Positive relationship between education level and concern
- Males are less concerned about coastal risk
- Positive relationship between self-reported knowledge and involvement

RESPONSE RATES

	Lake Residents	Near-lake Residents	Inland Residents	Total
Invitations mailed	602	1,816	6,002	8,420
Responses	168	255	501	924
Response rate %	27.9%	14.0%	8.3%	11.0%

Municipal official responses (n=56)

RESULTS: COASTAL RISKS

First, we were curious about how concerned residents are about the seven environmental concerns related to climate change in the next 10 and 50 years. Flooding and coastal erosion were separated in our survey.

Coastal Risk	10 Years	50 Years
Coastal erosion	3.84 (1.17)	3.94 (1.23)
Increases in extreme temperatures	3.29 (1.36)	3.54 (1.43)
More flooding events	3.13 (1.30)	3.48 (1.37)
Reduced ice coverage on the Great Lakes	3.12 (1.32)	3.42 (1.42)
More frequent and severe storms	2.93 (1.28)	3.29 (1.41)
More precipitation as rain than snow	2.82 (1.27)	3.21 (1.39)
Increases in precipitation	2.72 (1.23)	3.17 (1.39)

Responses were coded from 1 (not at all concerned) to 5 (extremely concerned). Average response listed with standard errors in parentheses.

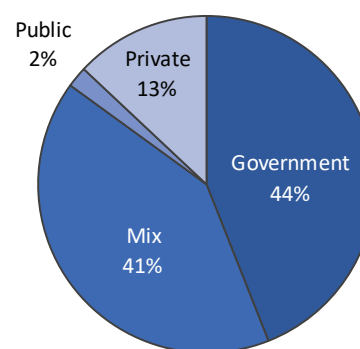
RESULTS: GOVERNANCE

Participants were asked who they think owns coastal shoreline and who they think is responsible for managing the coastal shoreline in their communities in a “mark all that apply” question. Their responses were grouped into four categories: (1) “Private” which included response options “you” and “your neighbor;” (2) “Government” which included response options “Local Government,” “State Government,” and “Federal Government;” (3) “Public” which included responses that mentioned “the general public” or “everyone” having ownership of the shoreline, and (4) “Mix” which included two or more of the categories previously listed, and (5) other. Participants were also asked about receding shoreline management strategies, such as man-made, natural, mix, other, a combination or neither.

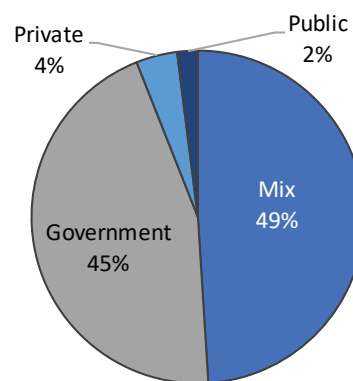
RESULTS: COASTAL RISK PERCEPTIONS

For this project we used the concepts from the Risk Information Seeking and Processing (RISP) framework to explore different constructs of risk. Constructs of severity, susceptibility, dread, and concern for the health of the Great Lakes, private property, and public spaces were closely related and therefore grouped into the general category of “Concern.” The constructs of informational subjective norms, information gathering capacity, and perceived behavioral control were grouped into the category “Self-reported Knowledge” (“Knowledge”) as another facet of risk perception.

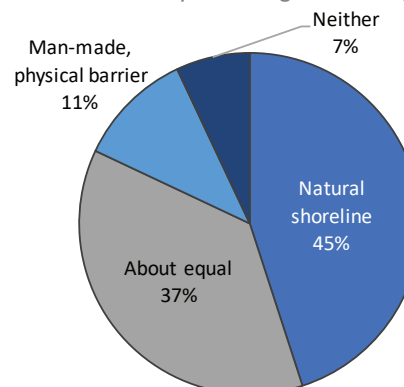
Who do you think owns coastal shoreline in your community?



Who do you think is responsible for managing coastal shoreline in your community?



What is the best way to manage a receding shoreline?



RESULTS: MOTIVATIONS FOR COASTAL HABITAT STEWARDSHIP

To understand motivations for coastal habitat management, we asked participants several questions that measured their levels of concern about the health of the Great Lakes coastal region. We also asked participants if they have ever been involved in a program or organization whose primary goal was Great Lakes coastal zone management, and if so which program or organization and why they became involved.

Table 1. Regression models of the final structural models for Concern and Knowledge risk scores.

Variables	Model 1: Concern	Model 2: Knowledge
County size (ref: Small)		
Mixed	-.03 (.12)	-.03 (.10)
Large	.04 (.14)	.00 (.12)
Resident location (ref: Lake)		
Near-lake	-.20 (.12)	-.10 (.11)
Inland	-.32 (.12)**	-.15 (.10)
Municipal officials	-.13 (.20)	-.17 (.17)
Resiliency policy	-.32 (.10)**	.05 (.09)
Previous experiences	.04 (.01)***	.02 (.01)**
Property ownership time	-.03 (.03)	.04 (.02)
Year-round resident	-.16 (.09)	.10 (.08)
Education (ref: graduate degree)		
Associate degree or less	-.33 (.11)**	-.13 (.10)
Bachelor's degree	-.17 (.08)*	-.19 (.07)**
Income	-.05 (.03)	.01 (.03)
Male	-.34 (.08)***	-.04 (.07)
Age	.00 (.00)	.00 (.00)

* $p < .05$; ** $p < .01$; *** $p < .001$. Regression coefficient listed with standard errors in parentheses.

SIGNIFICANT FINDINGS

- Inland Residents are less concerned about coastal risk than Lake Residents.
- Communities lacking resiliency policies are less concerned than communities with resiliency policies.
- The more previous experiences residents have with coastal risk, the more concerned they are and the more knowledgeable they are about coastal risk.
- Residents with associate degrees or less and bachelor's degrees are less concerned about coastal risk than those with graduate degrees.
- Residents with bachelor's degrees are less knowledgeable about coastal risk than those with graduate degrees.
- Males are less concerned about coastal risk than non-males.

Table 2. Number and frequency of respondents who said they were involved.

	Response Rates
Yes	307 (35.2%)
No	565 (64.8%)

Table 3. Global model, county characteristic and socio-demographics.

Variables	Model
County size (ref: Small)	
Mixed	1.09 (.31)
Large	.89 (.29)
Resident location (ref: Lake)	
Near	.58 (.16)
Land	.41 (.11)**
Municipal official	.87 (.39)
Resiliency policy	.68 (.17)
Previous experience	1.05 (.02)**
Ownership time	1.26 (.09)**
Year-round resident	1.28 (.27)
Education (ref: graduate degree)	
Associate degree or less	.65 (.18)
Bachelor's degree	.85 (.17)
Household income	1.03 (.08)
Male	.74 (.14)
Age	.99 (.01)

* $p < .05$; ** $p < .01$; *** $p < .001$. Odds ratios displayed with standard error in parentheses.

SIGNIFICANT FINDINGS

- The odds of involvement are lower for Land Residents than Lake Residents.
- As the number of previous experiences increases, the odds of involvement also increase by 5%.
- The odds of involvement are 26% higher the longer residents have owned property or lived in a coastal community.

PARTICIPANT SOCIO-DEMOGRAPHIC INFORMATION

Characteristic	Response
Age	average: 60.87 (range: 19-91)
Previous experiences with coastal risks	average: 3.11 events (range: 0-111)
Property ownership time	average: 11-20 years
Income	average: \$75,000 - \$99,999
Year-round resident	73.29% year round
Resiliency policy	57.63% has policy/program
Gender	59.62% male
Education	
Associate degree or less	18.34% high school, associate, some college
Bachelor's degree	37.13% bachelor's
Graduate degree (ref.)	44.53% master's or higher
County size	
Small (ref.)	26.60% Allegan County
Mixed	50.86% Ottawa County
Large	22.54 % Muskegon County
Resident location	
Lake (ref.)	17.13% lake-front property
Near-lake	25.99% 0.25 miles from Lake Michigan
Inland	51.07% more than 0.25 miles from Lake Michigan
Municipal officials	5.81% municipal official or staff

The Michigan State University Institutional Review Board approved this study on October 22, 2018 (STUDY00001557).

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