



Beach management in Florida: Assessing stakeholder perceptions on governance



Eduard Ariza ^{a,*}, Kenyon C. Lindeman ^b, Pallab Mozumder ^c, Daniel O. Suman ^d

^a Department of Geography, Facultat de Filosofia i Lletres, Universitat Autònoma de Barcelona (UAB), 08193 Bellaterra, Spain

^b Florida Institute of Technology, Dept. of Education and Interdisciplinary Studies, 150 West University Blvd., Melbourne, FL 32901, USA

^c Department of Earth & Environment, Department of Economics and Social Science Research Laboratory, International Hurricane Research Center, Florida International University, Miami, FL 33199, USA

^d Rosenstiel School of Marine and Atmospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149, USA

ARTICLE INFO

Article history:

Available online xxx

ABSTRACT

Comprehensive analyses of governance processes and stakeholder perceptions of beach management in Florida and many other coastal areas are lacking. Based on exploratory interviews and literature reviews, a survey instrument was administered that quantitatively queried seven primary stakeholder groups on fundamental issues regarding the management of Florida's beaches. Stakeholders expressed complex opinions including a mixture of both satisfaction and dissatisfaction with management of beaches in the state. There was a lack of consensus on multiple issues with considerable concern about several management issues including reactive, not proactive approaches, incomplete stakeholder representation and limited control of coastal construction. There were also concerns about the long term emphasis on engineering (seawalls, groins and breakwaters) relative to other management options (land use policies). Both political processes and availability of finances were often cited as primary reasons for Florida beach management challenges (39% and 44% of stakeholders respectively). The data also suggested polarization regarding the long term priorities of beach management in several questions including beach nourishment projects and planning for Sea Level Rise (SLR). Primary elements influencing satisfaction/dissatisfaction were the management of natural resources, politics, institutional coordination, public hearing effectiveness and control of coastal construction.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

The fundamental principles of coastal management assume that management actions adequately reflect the best available science and fully consider stakeholder perspectives (Cicin-Sain and Knecht, 1998; Beatley et al., 2002; Jasanoff, 2007; Shipman and Stojanovic, 2007; Ariza et al., 2010). Optimal policy actions require a coherent integration of diverse perspectives to form a common vision based on scientific and ethical standards of governance (Brulle, 2000).

Institutions have been defined as “enduring regularities of human action in situations structured by rules, norms and shared strategies as well as by the physical world” (Crawford and Ostrom, 1995). Following this definition, analysis of institutions is a key element of the management of natural resources (Ostrom, 1990) and an important way to understand the main attributes of institutions is through stakeholder perspectives (Janssen and Ostrom, 2006). The present worldwide degradation of beach areas (Defeo et al., 2009),

demands transdisciplinary approaches for their research and governance. Traditionally, research on beaches has emphasized physical studies, especially in the field of coastal engineering. In the last decade, however, more comprehensive efforts have attempted to include environmental science, human use, and management (James, 2000), develop planning and strategic management guidelines (Micallef and Williams, 2002), and examine the economic importance of beaches (e.g. Houston, 2008; Shrivani et al., 2003). Other studies have examined relationships among tourism and beach management, the social implications of coastal erosion management strategies presently in use (Cooper and McKenna, 2008), fundamental principles and practice of beach management (Williams and Micallef, 2009) and beach user perceptions (Roca and Villares, 2008). Despite this, quantitative analysis of stakeholder perspectives on the elements of institutional management of beaches (e.g., goals, resources, coordination, public participation) are uncommon (Estevez, 1990; Ariza et al., 2008).

Conflicts between beach development, ecological preservation, and social traditions have occurred in many coastal areas of the

* Corresponding author. Tel.: +34 93 581 48 06.

E-mail address: ariza.eduard@gmail.com (E. Ariza).

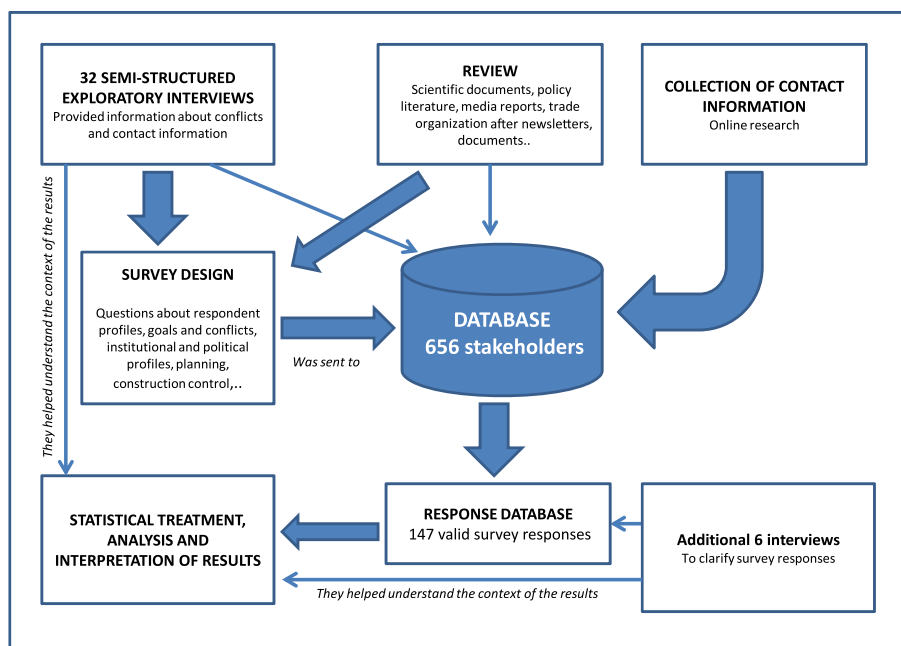


Fig. 1. Flow diagram of the survey and analytic methods. Thickness of the arrows indicates relative contributions of the input.

world including the Mediterranean (Williams and Micallef, 2009), Caribbean (e.g., Honey and Rome, 2001; Lindeman et al., 2003; Murray, 2007) and elsewhere. Florida is of particular interest due to its well-known coastal ecosystems and the heavy concentration of human activities in many beach areas due to major real estate and tourism industries. With 1 350 miles of Atlantic Ocean and Gulf of Mexico shoreline (approximately 825 miles of which are beaches), the annual coastal economic production of Florida, including fishing activities was approximately \$702 billion in 2010 (NOAA, 2010). The warm climate, abundant tourism infrastructure, and varied natural resources have continuously attracted visitors and new residents in high numbers for over 100 years (Stronge, 2004). Most of the housing and associated infrastructure to meet the needs of new residents and tourists has been constructed in coastal areas, often near beaches and on dunes, a process that continues on the back-sides of dunes in the state.

A large and complex beach management industry has evolved in Florida that involves engineering firms, local and state real-estate interests, local through federal agencies, dredging companies, and lobbying organizations seeking funding for dredging contracts. The most important state agency is the Florida Department of Environmental Protection's (FDEP) Bureau of Beaches and Coastal Systems, which manages the state's Coastal Construction Control Line Program (CCCL), the Joint Coastal and Environmental Resource Permitting Program, and others. In addition to the engineering demands of these programs, there is considerable administrative complexity due to the major role of coastal real estate in the economics and politics of Florida.

Geologically, the large Florida peninsula is a very flat coastal plain and represents almost half of the national population exposed to SLR and storm impacts, with several of the most threatened cities in the US (Strauss et al., 2012a, 2012b; Tebaldi et al., 2012). Preliminary analysis suggests about \$30 billion in taxable property is vulnerable in just three counties in southeast Florida, not including the county with the most coastal real estate at risk in the state and the nation, Miami-Dade (Strauss et al., 2012a).

Beach management policies in Florida and elsewhere (see Cooper et al., 2009) have been questioned in terms of long-term

economic, administrative, and environmental criteria (e.g., Nelson, 1989; Bush et al., 2001, 2004; Bishop et al. 2006; Peterson et al., 2000; Ruppert, 2008). Though some planners have been concerned about climate change in Florida since at least the late 1980s (Estevez, 1990), a notable attribute of Florida beach management has been an absence of state-scale sea level adaptation planning (e.g., Bush et al., 2004; Pilkey and Young, 2009), despite widespread scientific agreement on accelerating SLR and reviews suggesting a plausible 0.75–1 m rise by 2 100 (e.g., Beever et al., 2009; Rahmstorf, 2010; SFRCCC-TAWG, 2011).

Comprehensive and independent analyses of the institutional structures and effectiveness of beach management are lacking for many basic policy attributes in this vulnerable region. Identification of multi-stakeholder management perspectives can advance science-based, pluralistic and sustainable beach management policies in Florida. Given this need, we queried seven primary stakeholder groups on fundamental policy issues in a first effort to characterize the broad institutional elements responsible for the management of Florida's beaches.

2. Methods

The research was developed using semi-structured interviews and structured questionnaires. Preliminary semi-structured interviews allowed us to design the survey instrument and provided information about different beach management processes. They also helped interpret the quantitative results provided by the structured survey.

2.1. Pre- and post-survey interviews

During 2010, 32 detailed, semi-structured interviews were performed with coastal managers and stakeholders. The interviews included state managers, local managers, community and environmental group leaders, researchers, consultants and tourism development representatives. These interviews informed the design and content of the beach management survey instrument and enhanced understanding of beach management policy in

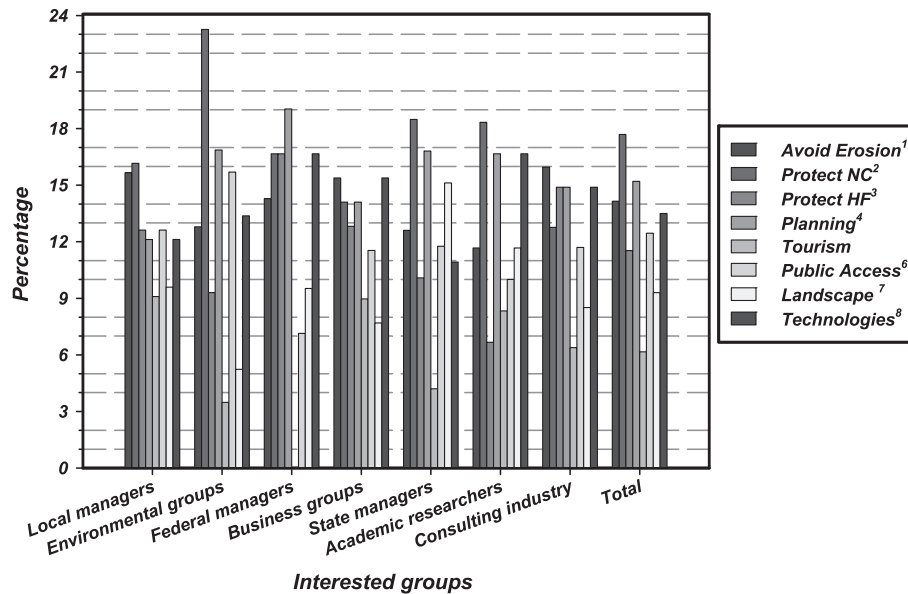


Fig. 2. The most important beach management goals for different stakeholder groups. Notes: Responses are based on the question, 'What are the most important goals of beach management?' The following categorization was used: 1. Avoid Erosion = Prevention and recovery from erosion processes 2. Protect NC= Protection of natural communities (dune communities, turtle nesting, bird nesting, coral reef.) from human impacts 3. Protect HF=Protection of human facilities and buildings from storm damage 4. Planning = Development of an integrated and proactive plan considering all interests of different groups of the area and adapted to characteristics of beaches 5. Tourism = To attract as many tourists as possible 6. Public Access = Creation and maintenance of beach public access 7. Landscape = Preservation of the original beach landscape from excessive construction 8. Technologies = Use of appropriate technologies for beach management.

Florida. Subsequent to the surveys, an additional eight interviews were conducted with eight different stakeholders to clarify responses from the survey instrument and to sharpen understanding of management performance perspectives (Fig. 1). Use of semi-structured interviews for informing survey content was based on reviews of mixed methods research (Bryman, 2012). We followed the ethical protocols for surveys within standard criteria used by the Florida International University Institutional Review Board.

Questions focused on five themes: 1) institutional organization and profile (activities, departments involved, background of managers, coordination, planning and goals); 2) roles of the stakeholders in different issues (e.g., natural resources, erosion, monitoring, safety and general beach maintenance); 3) public participation (coordination, communication and information, transparency); 4) sources of potential conflicts; and 5) satisfaction with the beach management process. The interviews were recorded (SONY ICD-PX720) and the content was re-examined as appropriate to specific issues.

2.2. Survey instrument: content and protocol

Information obtained from interviews, along with extensive review of the scientific and policy literature, media reports and trade organization reports informed development of the survey instrument. Based on the pre-survey interviews and the literature review, the survey quantitatively queried primary stakeholder groups (described below). Questions within the survey instrument utilized standard query options including rating scales (1–10), multiple choice, prioritization and open-ended formats. Before implementation, the survey was tested for a period of one month among a group of ten stakeholders representing the different surveyed stakeholder groups (the survey was sent online for receiving and assessing feedback). Suggestions and corrections were incorporated into the final online survey instrument.

The survey questions were structured into differing categories: Respondent Profiles (2 questions); Beach Management Goals and

Conflicts (2 questions); Institutional and Political Profiles (9 questions); Planning, Coastal Construction Control Line (CCCL) and Access (5 questions); Natural Resources, Erosion, Storms and SLR (6 questions). Satisfaction with management performance was examined in terms of Stratified Stakeholder Patterns (2 questions) and Pooled Stakeholder Patterns: Financial and Political Issues (1 question). An open-ended final opinion question closed the survey.

To ensure comprehensive survey responses, contact information for as many stakeholders as possible was obtained using different sources. Online research and responses from interviews provided contact information for government agencies at federal through local scales, environmental groups, consulting companies, business groups, and other beach management stakeholders in Florida. Local managers also provided contact information of stakeholders in their different counties. A list of people to solicit especially from government agencies and companies was also obtained from the Directory of the Florida Shore and Beach Preservation Association (FSBPA) (2009 Edition). A database with contact information for 656 beach management stakeholders was ultimately created. In September 2010, we informed these stakeholders of the project by an e-mail which contained a web link to the survey and invited all to anonymously complete the survey. Three reminders were sent (two in October, 2010, and the last in late November 2010).

2.3. The stakeholders

Out of 656 beach management stakeholders that were surveyed, we collected 147 valid survey responses from 30 counties in Florida. The overall usable response rate was 22.4%, which is an acceptable percentage for this survey type (Baruch, 1999). Mozumder et al. (2011) had a 26% survey response rate in a study of coastal management experts in the Florida Keys. The following stakeholder groups provided responses in these ratios: local agencies 25.1% ($n = 37$), state agencies 14.3% ($n = 21$), federal agencies 3.4% ($n = 5$), environmental groups 29.26% ($n = 43$), business representatives 4.8% ($n = 7$), academic researchers 14.3% ($n = 21$) and consulting

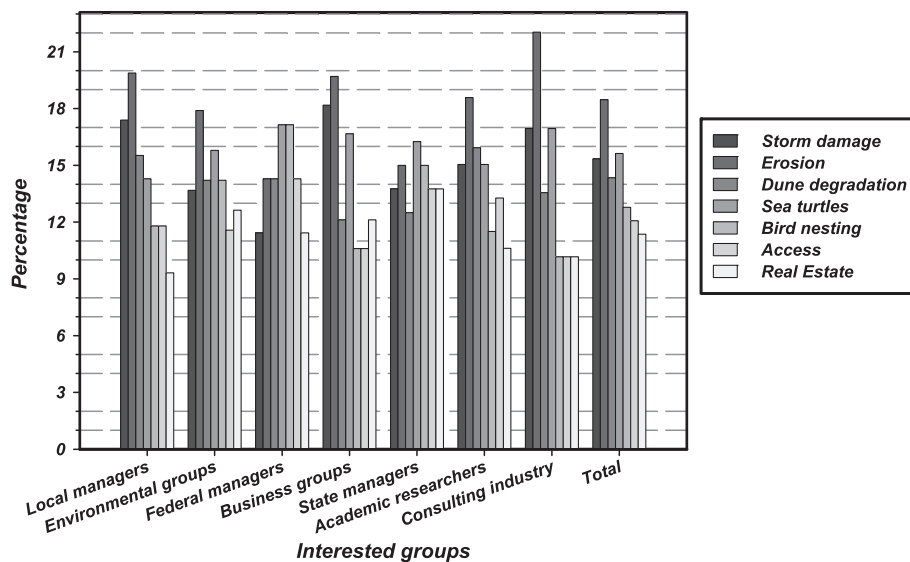


Fig. 3. Major sources of potential conflict for different stakeholder groups. Note: Responses are based on the question, ‘Which are the main issues of conflict in beach management in your county?’.

industry 8.8% ($n = 13$). For local, state, and federal agencies, the numbers in part reflect the relative amount of staff employed directly or indirectly on beach management issues around Florida.

The composition of the stakeholder groups included the following: 1) Local managers: staff from city and county governments, and other local institutions working on beach management issues; 2) state managers: State of Florida staff responsible for the management of beaches; 3) Federal managers: U.S. government agency personnel responsible for issues related to beach management; 4) Environmental groups: staff and members of environmental NGOs with experience in beach management or oversight; 5) Business representatives: private sector individuals with retail interests in beach resources; 6) Academic researchers: university researchers with experience in beach systems; 7) Consulting industry: representatives of consulting firms involved in beach engineering and bio-physical studies.

2.4. Analyses

Results obtained for the pooled data and different stakeholder groups were tested for statistically significant differences using non-parametric Kruskal-Wallis (KW) and Mann-Whitney (MW) tests. Parametric statistics could not be used in the majority of instances because of the sample sizes for individual variables (e.g., low sample sizes for federal managers in many questions). The Stata 9.0 software package was used to perform analyses. To examine factors influencing management satisfaction at federal, state and local levels, four ordered logistic regressions were performed. The categorical variables ‘‘Overall satisfaction’’, ‘‘Satisfaction at the federal level’’, ‘‘Satisfaction at the state level’’, and ‘‘Satisfaction at the local level’’ were used as dependent variables. Satisfaction refers to the beach management performance of each of the three administrative scales examined. Nine independent variables were examined to parse specific factors influencing satisfaction: natural resources, horizontal and vertical coordination, setback lines, technical background of managers, public hearings, and federal, state and local best practices.

The four models were created with a common set of variables (and some adjustments to explain the variability of each model. The General Model (Model 1) is composed of factors that measure

coordination among institutions (vertical and horizontal), the management of natural resources and the CCCL, the knowledge of managers and the quality of the public participation process. The variables common to all models were those with potential to affect at all levels of management (natural resources, setback lines, technical background of managers, public hearings and vertical coordination). The specific variables (adjustments) were those that only apply to specific levels (horizontal coordination, federal best practices, state best practices and local best practices).

3. Results

3.1. Beach Management Goals and Conflicts

The most important goals for all respondents pooled were the protection of natural communities from human impacts (including dune communities, sea turtles, reefs, and bird nesting) (Fig. 2), the development of integrated and proactive beach management plan (considering all different interest groups), and the prevention of or recovery from erosion processes. Other important goals were the protection of facilities and buildings from storm damage and the use of appropriate technologies as well as the creation of beach public access and preservation of the original landscape. All stakeholder groups, with the exception of consulting companies and business representatives, ranked protection of the natural community or integrated management plans as the most important priorities (Fig. 2). When asked about the most important conflicts, most groups identified the choices: a) erosion and b) damage to environmental resources (Fig. 3).

3.2. Opinions on institutional attributes

Most stakeholder groups stated that Florida beach management is reactive or mixed. Business representatives were the only group stating that management is proactive (Table 1). In terms of relevant knowledge, stakeholders most frequently stated that beach managers have a moderate to good technical background (Table 2). Differences found among stakeholder groups were statistically significant ($p < 0.01$; K-W test $X^2 18.32$). Stakeholders also stated that academic and professional training for future beach managers

was moderately adequate (5.7 ± 0.2) (Table 1). Opinions on the effectiveness of public hearings varied (Table 2) but did not statistically differ among the groups ($p > 0.01$; KW test X^2 13.60) (Mean score 5.2 ± 0.2). Many respondents did not consider the most important interests of stakeholders to be well represented (Table 1). Respondents commonly stated that often there was not adequate representation (42.2%) or that it depended on each particular case (27.5%). Environmental groups (58.3%), business representatives (85.7%) and academic researchers (56.2%) were less satisfied with representation. The groups that were perceived to be most underrepresented were local citizens, environmental groups and fishermen (54, 43 and 41 respondents stated that they were underrepresented).

Coordination among federal, state and local agencies, and among local managers and stakeholders (horizontal coordination) was assessed. The overall value obtained was intermediate (5.88 ± 0.2). Local managers (7.5 ± 0.4), federal managers (7.4 ± 0.4) and state managers (5.8 ± 0.9) were more satisfied than other stakeholders (there were significant differences among the groups ($p < 0.01$; KW test X^2 21.68)). In the case of coordination among local managers and stakeholders (Fig. 3), the mean value was 6 (± 0.26). The scores differed significantly among all of stakeholder groups ($p < 0.01$; KW test X^2 19.35). Local managers (7.6 ± 0.4), federal managers (7.4 ± 0.4) and the consulting industry (6.5 ± 0.5) gave higher ranks. The groups less satisfied with coordination were business representatives (3.2 ± 1.1), environmental groups (5.1 ± 0.5) and academic researchers (5.4 ± 0.6).

Most stakeholders felt that some measures could be applied to improve coordination (96.5%). Stakeholders mostly sought: 1) better education of managers and stakeholders about environmental and economic issues, 2) proactive plans with goals established after deliberation among all interested parties, and 3) workshops/focus groups where all interested groups could participate and deliberate. Stakeholders in general felt that improved coordination is more related to new ways of doing public participation than increasing the number of public hearings or modifying current administrative structure.

Stakeholders were critical of the decisions made by politicians in regards to beach management. Although dissatisfaction with politics was present for all administrative levels (local, state and federal), results were especially low for federal politics (Fig. 4). Apart from federal managers who gave intermediate scores, other groups provided very low scores that differed statistically ($p < 0.01$; KW test X^2 20.27). For both state and local political decision-making, among group differences were statistically significant ($p < 0.01$; KW test X^2 28.67 and $p < 0.01$; X^2 29.33). Mean scores were higher for local (4.8 ± 0.2) and state politics (4.2 ± 0.2) than for federal politics (3.6 ± 0.2).

3.3. Planning, Coastal Construction Control Line (CCCL) and access

Stakeholders were critical of the way setbacks are managed to protect beaches and dunes (in particular, the Coastal Construction Control Line [CCCL]) with a high number of respondents giving very low scores (Fig. 5A and 5B). A common comment from stakeholders was that development has been allowed too close to beaches and that setbacks are not respected, in part due to lack of administrative clarity and follow-through (e.g., Ruppert, 2008) and the lack of visible control of coastal construction (e.g., new high-rise construction projects continue to receive permits on the back sides of dunes in Florida).

Scores obtained for land use practices in coastal areas were intermediate (Table 2) and no significant differences among the groups were found ($p > 0.01$; KW test X^2 13.18). The mean score (6.3 ± 0.2) suggested that stakeholders were in favor of more

zoning of beach uses (but differences were not significant differences: $p > 0.01$; KW test X^2 6.14).

Respondents (70.2%) favored public beach access over private access (Table 1). Only 1.6% of the stakeholders were in favor of restricting access only to property owners. Most stakeholders felt that public access to beaches was moderately restricted by private property in their counties (5.6 ± 0.3) (Table 2).

3.4. Natural Resources, Erosion, Storms and SLR

Stakeholders responded differently regarding the management of natural resources ($p < 0.01$; KW test X^2 20.11). Many groups of Florida beach management stakeholders were critical (environmental groups, business representatives, state managers and academic researchers); local and federal managers, however, gave scores above 6 (Fig. 6).

Many stakeholders stated that beach management programs in their counties were well designed to handle emergency events (Table 2; $p > 0.01$; KW test X^2 15.90) although they stated that development had been allowed too close to the water line.

In the case of beach engineering in Florida (Table 3), 23.6% of stakeholders considered effects to be positive. Most stakeholders stated that effects have been mixed (45.5%) or negative (30.9%) (39 and 44 respondents, respectively). The most satisfied groups were business representatives (60%) and the most critical were the environmental groups (67.6%).

In terms of responses regarding beach renourishment effects, 61 individuals said “positive” and 59 said “it depends” or “negative” (34 and 25 individuals, respectively). Federal managers (80%), local managers (71.4%), and consulting industry representatives (66.6%) were most favorable; state managers (33.3%), environmental groups (32.4%), and academic researchers (31.6%) were less favorable. Comments received from stakeholders from the interviews and the final open-ended question could be divided into two groups: 1) those that remarked on the proactivity of renourishment programs and 2) those that were concerned about the environmental impacts, the potential promotion of even more development and the economic costs for taxpayers.

Most stakeholders had seen information about sea level rise (SLR) in their counties (91.8%) (Table 4). By percentage, one third of the stakeholders were not concerned about SLR. The least concerned were business representatives (42.9%) and federal managers (60.0%). Environmental groups and academics were the most concerned about the effects of SLR (79.5% and 78.9%). Some respondents felt that many managers and politicians still do not seriously recognize the implications of SLR (building in high-risk flood zones continues).

3.5. Satisfaction with management performance

3.5.1. Stakeholder patterns

Satisfaction with the different levels of management ranged from intermediate to good. The scores among the three levels of government differed significantly (1-Federal: $p < 0.01$; KW test X^2 17.50, 2-State: $p < 0.01$; KW test X^2 18.19, 3-Local: $p < 0.01$; KW test X^2 28.75); federal and local managers gave the highest ranks for the management performance. Environmental groups and business groups typically gave the lowest ranks. In overall scores, significant differences were found among all the stakeholder groups ($p < 0.01$; KW test X^2 29.41). Mean results were intermediate (5.44 ± 0.2). Local managers and federal managers gave the highest scores (above 7) and environmental groups and business representatives gave the lowest scores (below 5).

Table 1

Percentage of each type of response to different questions on beach access conflicts, managers and stakeholders representation and proactive management (number of responses are reported in the parentheses).

Stakeholders (sample size)	1) Position on beach access conflicts			2) Managers and stakeholders representation			3) Proactive or reactive		
	GP	BO	D	Yes	No	Depends	Proactive	Reactive	Both
Local managers (28-35)	71.4 (25)	5.7 (2)	22.8 (8)	67.8 (19)	17.8 (5)	14.3 (4)	30.5 (11)	13.9 (5)	55.5 (20)
Environmental groups (36-43)	68.3 (28)	2.4 (1)	29.3 (12)	19.4 (7)	58.3 (21)	22.2 (8)	4.6 (2)	51.1 (22)	44.2 (19)
Federal managers (5)	80.0 (4)	0.0 (0)	20.0 (1)	20.0 (1)	40.0 (2)	40.0 (2)	20.0 (1)	20.0 (1)	60.0 (3)
Business groups (7)	85.7 (6)	0.0 (0)	14.3 (1)	14.3 (1)	85.7 (6)	0.0 (0)	42.8 (3)	28.5 (2)	28.6 (2)
State managers (14-17)	70.6 (12)	0.0 (0)	29.4 (5)	28.6 (4)	28.6 (4)	42.8 (6)	6.2 (1)	43.7 (7)	50 (8)
Academic researchers (16-21)	57.1 (12)	0.0 (0)	42.8 (9)	25.0 (4)	56.2 (9)	18.7 (3)	9.5 (2)	47.6 (10)	42.8 (9)
Consulting industry (11-13)	58.3 (7)	0.0 (0)	41.6 (5)	36.4 (4)	9.1 (1)	54.5 (6)	23.1 (3)	30.7 (4)	46.1 (6)
Mean Percentage	70.2	1.57	28.6	30.21	42.25	27.51	16.3	36.2	47.5

Notes: 1) What is your position on beach access conflicts (difficulties for beach users in reaching the beach, due to the fact that part of the beaches (down to Mean High Water Line) and their hinterland are private areas)? GP = in favor of the General Public, BO = in favor of Beach Property Owners, D = depends on the case); 2) Do you think that all important agents and stakeholders are well represented in the beach management program of your county? 3) Do you think that beach management in your county is reactive or proactive?.

3.5.2. Factors influencing management satisfaction at federal, state and local levels

Logistic regression models were applied to four categorical variables: overall satisfaction (Model 1), federal satisfaction (Model 2), state satisfaction (Model 3) and local satisfaction (Model 4) (Table 5). Nine independent variables that could influence the level of satisfaction were examined: natural resources, horizontal and vertical coordination, setback/CCCL, technical background of managers, public hearings, federal, state and local best practices.

Coefficients of several variables were statistically significant in predicting agreement with the levels of satisfaction (Table 5). The role played by politics at all levels was very important in all of the

different models. The management of natural resources was significant in Models 1 and 4 but not significant in Models 2 and 3. Horizontal coordination was significant in Models 1 and 4 (Table 5). Horizontal coordination was not included in Models 2 and 3 because it was intended to capture coordination among local institutions. The functioning of setbacks/the CCCL for protecting beaches and dunes was significant in Models 1, 2 and 3.

Satisfaction with the technical background of managers was significant in Models 1 and 4. The background of managers was not a significant aspect influencing satisfaction at state or federal levels but was at local levels. Satisfaction with the functioning of the public hearings was significant in Model 1 and 3 and near

Table 2

Mean and st. error (SE) of score values [1 (No) to 10 (Yes)] for the different groups (number of responses in parentheses).

Stakeholders		Land use ^a	Zoning ^b	Background managers ^c	Training ^d	Beach access ^e	Emergencies ^f	Public hearings ^g
Local managers	Mean	6.80	6.00	7.42	6.62	5.41	7.65	6.51
	SE	±0.41	±0.45	±0.35	±0.42	±0.54	±0.43	±0.43
	N (29-37)	(35)	(35)	(36)	(37)	(34)	(32)	(29)
Environmental groups	Mean	4.44	6.57	5.28	4.82	5.88	5.69	4.37
	SE	±0.44	±0.38	±0.43	±0.41	±0.43	±0.48	±0.42
	N (38-41)	(41)	(40)	(39)	(40)	(41)	(39)	(38)
Federal managers	Mean	6.60	6.00	7.20	7.00	4.20	7.60	5.60
	SE	±0.75	±0.89	±0.49	±0.63	±1.83	±0.24	±0.93
	N (5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Business groups	Mean	5.00	5.86	3.57	4.28	5.14	5.28	4.16
	SE	±1.38	±1.37	±1.02	±1.34	±1.49	±0.81	±0.14
	N (6-7)	(7)	(7)	(7)	(7)	(7)	(7)	(6)
State managers	Mean	5.50	7.07	6.60	6.57	5.00	6.07	5.41
	SE	±0.71	±0.54	±0.78	±0.77	±0.67	±0.74	±0.61
	N (14-17)	(16)	(15)	(15)	(14)	(14)	(14)	(17)
Academic researchers	Mean	5.76	6.79	5.26	4.89	6.43	6.11	4.79
	SE	±0.67	±0.55	±0.74	±0.70	±0.70	±0.56	±0.46
	N (18-21)	(21)	(19)	(19)	(19)	(21)	(18)	(19)
Consulting industry	Mean	5.08	4.92	6.38	6.23	5.42	6.58	5.18
	SE	±0.69	±0.83	±0.65	±0.63	±0.69	±0.67	±0.50
	N (11-13)	(13)	(13)	(13)	(13)	(12)	(12)	(11)
Mean	Mean	5.53	6.29	6.09	5.70	5.61	6.42	5.18
	SE	±0.24	±0.22	±0.24	±0.24	±0.26	±0.24	±0.22
	N (125-138)	(138)	(134)	(134)	(135)	(134)	(127)	(125)

Notes.

^a Do you think that land use planning practices applied in your county are appropriate for beach management?.

^b Do you think that zoning of different beach uses would be useful for beach management?.

^c Do you think that the technical background of beach managers in your county is adequate for effective management?.

^d Do you think that academic and professional training is adequate for educating future beach managers and stakeholders?.

^e Do private properties significantly restrict beach access in your county?.

^f Do you think that beach management in your county is effectively handled during emergencies (storms and other unexpected events)?.

^g Do you think that public hearings/public meetings/workshops about human activities affecting beaches (e.g. building on the back beach, nourishment, construction of groins,..) work effectively (e.g. people are informed in advance, schedules are good, attendants are able to do significant contributions, their opinions are considered and the overall outcome are improved results)?.

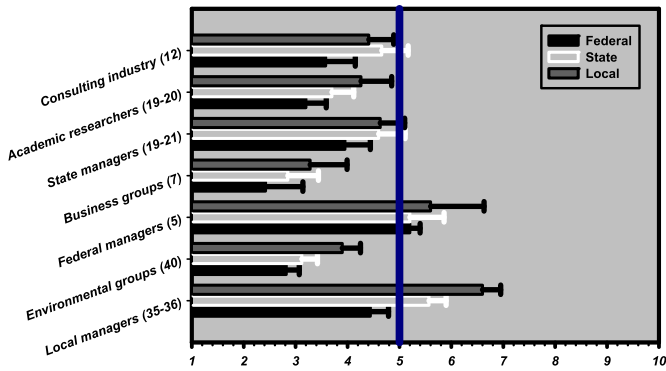


Fig. 4. Opinions on federal, state and local political decision-making for beach management. Note: Responses obtained for the question, “Do you think that Federal/State/Local politicians make the best decisions for beach management?”. Numbers in parenthesis show number of responses for each group.

significant at the federal level (Model 2; p -value 0.139). Surprisingly, public hearings was not significant factor at the local level (Model 4). Vertical coordination was significant at the state and federal levels (Models 3 and 2), suggesting that local governments were not seen by many respondents as responsible for coordination with higher levels of administration. Satisfaction with the decisions of

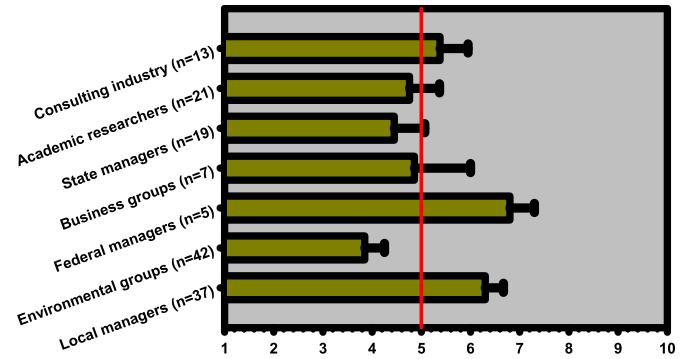


Fig. 6. Responses on the adequacy of management of beach natural resources (1 is lowest and 10 is highest); numbers in parenthesis show number of responses for each group. Note: The responses to the question “Do you think that the management of natural resources of beaches is adequate?”.

politicians (federal/state/local) regarding beach management was significant in Models 3 and 4 and near significant in Model 2 (p -value 0.133). Stakeholders stated that politics is an important factor for beach management at all levels of government.

3.5.3. Pooled Stakeholder Patterns: financial and political challenges

Responses suggested that the Florida beach management community is largely split into relatively different groups on some key issues. Most stakeholders considered major obstacles for beach management to be either financial (44.2%) or political (39.3%), though small parts considered the main challenges to be social (9.8%) or technical (6.5%). This distinction is important since members of the two main groups (financial and political) responded quite differently to the survey (Fig. 7). The financial-centric group was much less critical in responses than the political-centric group. The financial-centric group was typically satisfied with management. The political-centric group was often quite dissatisfied with beach management (except for management of tourism). Differences were also detected in the assessment of natural resource management, the CCCL, the technical background of managers the measures of coordination among institutions or the overall score (Fig. 7).

Survey results suggested that members of both financial- and political-centric groups were present among the seven stakeholder groups (local managers, environmental groups, federal managers, state managers, consulting companies, academic researchers and business representatives). Some groups tended to think of beach management in terms of political challenges (environmental groups, state managers and academic researchers), others in terms of financial challenges (local managers, business representatives and the consulting industry). In the case of the federal managers, both types of challenges were equally important.

4. Discussion

We assessed stakeholder perceptions regarding diverse features of beach management in the State of Florida. Although studies on stakeholder perspectives of beach management policy are not abundant, the results are in relative agreement with similar studies elsewhere (Defeo et al., 2009; Williams and Micallef, 2009; Phillips and Jones, 2006). Results reflect relative agreement about overarching goals, satisfaction with operational management, and a lack of satisfaction with the public policy process. Differences among stakeholders were found in perceptions of the technical background of managers, administrative coordination, decisions made

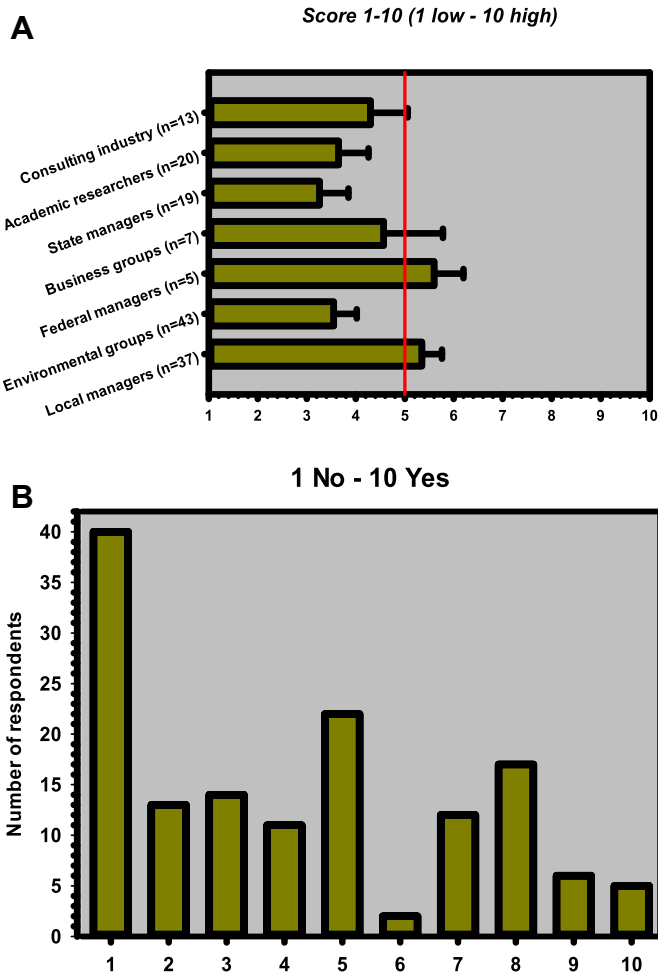


Fig. 5. Effectiveness of the setback line (i.e., Coastal Construction Control Line) for protecting beaches and dunes. A: mean scores and range. B: number of responses for each rank option from 1 to 10 (No to Yes). Note: Responses to the question, “Do you think that the setback line is effective for protecting beaches and dunes?”.

Table 3

Percentage of each type of response to questions regarding engineering projects and beach nourishment (number of responses in parentheses; P = Positive effects, N = Negative effects, D = Depends).

Stakeholders	Engineering ^a			Nourishment ^b		
	Positive	Negative	Depends	Positive	Negative	Depends
Local managers (23; 28)	34.8 (8)	30.4 (7)	34.8 (8)	71.4 (20)	3.5 (1)	25.0 (7)
Environmental groups (34; 37)	8.8 (3)	67.6 (23)	23.5 (8)	27.0 (10)	32.4 (12)	40.5 (15)
Federal managers (4; 5)	0.0 (0)	0.0 (0)	100.0 (4)	80.0 (4)	0.0 (0)	20.0 (1)
Business groups (5; 7)	60.0 (3)	20.0 (1)	20.0 (1)	42.8 (3)	28.6 (2)	28.6 (2)
State managers (12)	0.0 (0)	33.3 (4)	66.6 (8)	58.3 (7)	33.3 (4)	8.3 (1)
Academic researchers (16; 19)	25.0 (4)	37.5 (6)	37.5 (6)	47.3 (9)	31.6 (6)	21.0 (4)
Consulting industry (11; 12)	36.4 (4)	27.2 (3)	36.4 (4)	66.6 (8)	0.0 (0)	33.3 (4)
Mean	23.6	30.9	45.5	56.2	18.5	25.3

Notes.

^a Do you think that engineering works (seawalls, groins, breakwaters) have been beneficial or have caused negative effects?.

^b Do you think that renourishment projects have been beneficial or have caused negative effects?.

by politicians, management of natural resources, performance of different administrative levels and overall satisfaction. There was also a concern among some that SLR is not being addressed in planning.

4.1. Beach Management Goals and Conflicts

Despite the fact that the stakeholders had different perceptions and interests in beach environments in the questions related to goals and conflicts, their main goals were generally similar. They converged in choosing the protection of natural communities and the adoption of integrated plans as important objectives (reflecting the need for planning stressed by other studies, see Micallef and Williams, 2002). Main conflicts identified by stakeholders were the lack of sand and damage to environmental communities. These results are in accordance with many primary conflicts identified for beach systems in many locations globally (Defeo et al., 2009).

Attraction of tourists was not stated as a priority by most stakeholders. In the few cases that this was stated as a priority, it was highly ranked. Although stakeholders are aware of the importance of beaches for the economy of the state (Stronge, 2004; Houston, 2008), most did not emphasize that the attraction of tourists should be a priority of beach management. Perhaps they assume that achievement of other goals and the control of threats like erosion (see Phillips and Jones, 2006) would address this issue. It is likely that the differences among stakeholders are less about definitions of goals, and more about procedures to achieve them. That is, protection of beach natural resources is a priority; differences lie in the perceived actions to protect these systems.

4.2. Opinions on institutional attributes

A primary finding was the dissatisfaction of many stakeholders with beach management decision-making. The reasons varied among different groups. Many from the environmental community were disappointed in the continuous development on dunes and use of dredging projects, many from consulting companies were dissatisfied due to regulations and budget limitations on beach programs. However, dissatisfaction was also shared among stakeholder groups (i.e. variances in the CCCL program or coastal armoring; reactive not proactive management). Satisfaction of the stakeholders with the technical background of managers was largely “moderate-good”, although not all stakeholders agreed (business representatives). Very often the expertise of managers was largely related to coastal engineering, environmental science or administration, and background perspectives from the social sciences was lacking. This has generated a highly technocratic

approach to beach management that may not fully account for the plurality of values and perspectives present within the coastal community. Negative perceptions of management by stakeholders is not exclusive to the State of Florida; in other U.S. states (Pilkey and Dixon, 1996; Dean, 1999) and other countries (e.g., Williams and Micallef, 2009), similar patterns have been identified.

The data demonstrate dissatisfaction with political decision-making at local, state and federal levels. Forty percent of the stakeholders considered the challenges of beach management to be political (e.g., Fig. 7). This result may reflect a need for the creation of a metanarrative that includes the positions of all Florida beach management stakeholders. (Brulle, 2000) operating at different scales (Brondizio et al. 2009). The influence exerted by politically powerful economic actors that are vested in continuous development and maintenance of overdeveloped beaches has been repeatedly stated as a main driver of functional coastal management (e.g., Cheong, 2011). Decades of efforts by many groups has led to the establishment of diverse subsidies and insurance policies that favor development in flood zones (Bagstad et al., 2007) and helped create controversial policy dynamics (Dean, 1999; Peterson and Bishop, 2005; Lindeman et al., 2010; many interviews in the present study), as accelerated SLR becomes harder to ignore (SFRCCC-TAWG, 2011; Strauss et al., 2012a). Such trends have also been documented for other coastal areas (e.g., Cooper et al., 2009).

Important differences in stakeholder perspectives on coordination among either different administrative levels in the government or among local-level institutions were found. Managers were more satisfied with coordination than the rest of the groups. Almost all stakeholders stated that more coordination measures are needed and new measures suggested emphasized modification of the structure of public participation and mechanisms, as much as an increased frequency of input opportunities. Participation opportunities were sought that improve communication and deliberation among all stakeholders, not only perceived insiders, in proactive ways. These results reflect a need to consider beach management as a challenge where optimal planning is based on continuous adaptation through policy deliberation due to the imprecise and changing nature of the conflicts (Rittel and Weber, 1973).

Most respondents stated that not all stakeholders are well represented. Specific stakeholders that felt most excluded from the beach management process were local citizens, environmental groups, and fishers. Citizens not living in coastal areas commonly help pay for policies that benefit those living on or profiting from development in flood zones. Management approaches were perceived by some as mostly engineering-based and the goals are now narrowly focused on sand replacement with a long-term trend

Table 4
Response percentages for three questions regarding sea level rise (number of responses in parentheses; Y = Yes, N = No).

Stakeholders#	SLR 1 (Informed)		SLR 2(Adaptation)		SLR 3 (Concerned)	
	Y	N	Y	N	Y	N
Local managers (28-30)	90.0 (27)	10.0 (3)	60.7 (17)	39.3 (11)	72.4 (21)	27.6 (8)
Environmental groups (37-39)	60.5 (23)	39.5 (15)	35.1 (13)	64.8 (24)	79.5 (31)	20.5 (8)
Federal managers (5)	100.0 (5)	0.0 (0)	60.0 (3)	40.0 (2)	60.0 (3)	40.0 (2)
Business groups (7)	100.0 (7)	0.0 (0)	71.4 (5)	28.6 (2)	42.9 (3)	57.1 (4)
State managers (16)	100.0 (16)	0.0 (0)	43.7 (7)	56.2 (9)	68.7 (11)	31.2 (5)
Academic researchers (18-19)	100.0 (18)	0.0 (0)	31.6 (6)	68.4 (13)	78.9 (15)	21.0 (4)
Consulting industry (12-13)	92.3 (12)	7.7 (1)	58.3 (7)	41.7 (5)	66.6 (8)	33.3 (4)
Mean	91.8	8.2	51.5	48.4	67.0	33.0

Notes: (1) Have you been informed about the effects that the sea level rise (SLR) may have in Florida?

(2) And about the remedial measures to be taken? (3) Are you concerned about the effect that SLR may have on the beaches of your county?

away from basic land-use tools (e.g., effective setbacks, down-zoning, growth moratoria) despite SLR. A byproduct is that some stakeholders feel excluded or as second class participants in decision-making (e.g., beach management conferences with unaffordable registration costs and venues: >\$400 per person registration at elite hotels at >\$200/night). Beach management strategies and their political drivers commonly in use worldwide have been criticized from social justice perspectives (e.g., Cooper and McKenna, 2008). The results demonstrate that common institutional shortcomings in the management of natural resources (Norgaard, 1994; Ostrom, 2010) are also present in the management of Florida beaches.

4.3. Coastal Construction Control Line and beach access

Almost all stakeholder groups were critical of the effectiveness of the CCCL and other setbacks in the protection of beaches and dunes. A wide array of inconsistencies in the CCCL program has been detailed by Ruppert (2008) and others. The CCCL program is a seemingly fundamental element of beach management in Florida and influences stakeholder satisfaction, in part, as it implies there is some structure and control of coastal construction in Florida. Though climate change adaptation has not been a stated priority in Florida state coastal management, the effectiveness of the CCCL program will only increase in significance as SLR accelerates and storm damages increase. In this sense, the importance of establishing functional setbacks that respect bio-physical processes of beaches in the context of SLR has been considered to be relevant worldwide (Defeo et al., 2009; Sanò et al., 2011).

Issues involving private property and access to Florida beaches are commonly identified as important components of management

(legal reviews in Christie, 2009; Arnold, 2011). Beach access is highly restricted in some areas (Krantz, 2009). The respondents in this study felt that beach access is moderately restricted statewide and most favored public access over private limitations to access. In future studies, the perceptions of differing stakeholders on more detailed issues involving accessibility (e.g., due to economic variations among stakeholders) should be considered.

4.4. Natural Resources, Erosion, Storms and SLR

Although evaluations of the management of natural resources were not as negative as some other assessments, many stakeholders gave relatively low scores (except most local and federal managers). The natural resources of beaches were very important to most stakeholders; dune degradation, sea turtle issues, reef conservation and bird nesting were identified by many respondents as conflicts in Florida beach management. There was considerable concern about the management of sea turtles, in part because of the consequences of negative publicity associated with sea turtle impacts.

Due in part to a century of building on or near dunes, inlet construction and maintenance, and rising sea levels, erosion is present on many Florida shores (Bush et al., 2004; Pilkey and Young, 2009) and management efforts involve a diverse socio-economic debate given the federal and state subsidies that still encourage development in coastal areas (Bagstad et al., 2007). Most stakeholders reported negative or mixed attitudes on armoring (>75% of respondents). In the case of beach renourishment dredging projects, relatively greater satisfaction was expressed (57% positive, 43% negative or mixed) but stakeholders were split in terms of absolute numbers (61 positive, 59 negative), 70% of local

Table 5
Estimated likelihood of satisfaction with beach management in Florida by differing administrative levels (ordered logistic regression).

Variable	Model 1 Dep. Var.: Overall satisfaction		Model 2 Dep. Var.: Federal		Model 3 Dep. Var.: State		Model 4 Dep. Var.: Local	
	Coefficient	P values	Coefficient	P values	Coefficient	P values	Coefficient	P values
Natural resources	0.263	0.007***	0.065	0.468	0.075	0.427	0.232	0.023**
Horizontal coordination	0.264	0.035**	–	–	–	–	0.540	0.000***
Setback line	0.261	0.003***	0.165	0.066*	0.283	0.001***	0.012	0.881
Technical background of managers	0.249	0.012**	0.080	0.383	0.081	0.389	0.267	0.010**
Public hearings	0.224	0.018**	0.135	0.139	0.208	0.031**	0.084	0.397
Vertical coordination	0.142	0.269	0.204	0.054*	0.185	0.080*	–0.136	0.290
Federal best practices	–	–	0.203	0.133	–	–	–	–
State best practices	–	–	–	–	0.303	0.016**	–	–
Local best practices	–	–	–	–	–	–	0.313	0.013**
N	106		99		104		102	
LR chi ²	135.88		61.39		95.07		125.63	
Prob>chi ²	0.0000		0.0000		0.0000		0.0000	
R ²	0.2911		0.1369		0.2145		0.2827	

Notes: ***, **, * imply significance at 1%, 5% and 10% levels respectively.

managers considered beach renourishment to be positive, 58% in the case of state managers, but just 27% among environmental groups. The most common positive statements about beach renourishment emphasize the proactivity and organization of the programs. Many positions within local, state and federal agencies and consulting companies are directly funded by large renourishment projects.

Survey and interview results indicate that management of nearshore reefs along East Florida in the presence of semi-continuous dredge and fill projects is a particularly challenging issue. In areas where nearshore reefs are present, direct and indirect burial and turbidity impacts are challenging due to complex environmental monitoring issues ((Lindeman and Snyder, 1999; Peterson and Bishop, 2005; Wanless and Maier, 2007) and policy debates (Bush et al., 2004; Lindeman et al., 2010; Wanless, 2009). During the interviews, some stakeholders also expressed concerns about a) the taxpayer costs of dredging projects (e.g., non-residents subsidizing risky investments in flood zones) and b) the loss of sediments, which can be earlier than expected (Pilkey and Dixon, 1996).

Most stakeholders reported that they were aware of SLR but one third did not; this may be attributable to the intense politicization of the issue (Jaques et al., 2008; Pilkey and Young, 2009). The least

concerned were business groups and federal managers (approx. 50 and 60%, respectively). The finding that SLR was not an issue of high importance at any level of management (overall, federal, state or local) is important and contrasts with surveys on SLR in the Florida Keys (Mozumder et al., 2011), an area that is less dependent on beach-based sun and sand tourism. In many beach areas, building in flood zones continues and there is a currently another condominium building boom in Miami (NPR, 2013), paradoxically considered one of the most at risk cities for SLR (e.g., Strauss et al., 2012b). This is perhaps not surprising since past efforts to implement statewide climate change adaptation and education strategies (e.g. Florida's Energy and Climate Change Action Plan, CCS, 2008) have been stopped. In this sense, Estevez's (1990) findings regarding local planner concerns about SLR and coordination mechanisms for communicating SLR information appear prescient.

4.5. Satisfaction with management performance

Overall stakeholder group scores on management performance were intermediate. Ranks for local agencies were higher than for state and federal levels suggesting that federal and state managers can have different off-site perspectives than local stakeholders. Improvement of federal and state management performance perceptions may involve enhanced coordination with local agencies and improved public participation processes (Brulle, 2000; Farrell, 2009).

The findings suggest that beach management stakeholders in Florida represent at least two important categories: 1) those that consider political factors as the main obstacles to overcoming beach management challenges, and 2) those that consider the primary obstacles to be financial. Although all stakeholder groups had respondents in each of the two groups, the first group (political) was primarily represented by environmental groups, state managers, federal managers, and to a less extent, academics. The second group (financial) was mostly represented by local managers and business groups. Both groups scored the questionnaire in different manners. The stakeholders in the first group, as a norm, were more critical than the second group. For example, in the first group, only 35% of the respondents stated that nourishment projects have had positive effects. The rest either stated that the effects have been mixed (27%) or negative (37.5%). In contrast, among those considering the obstacles to be financial, 76% stated that renourishment projects are positive.

Many results in this study reflect a gap between the political and the financial perspectives. Past and current beach management strategies in Florida primarily follow the vision of the second. By default, the solution for most beach management problems, including SLR, is a Business As Usual approach (BAU). Effective mechanisms have been assembled from local through federal levels to channel hundreds of millions of dollars of funding into large dredge and fill projects as the backbone of Florida beach management. Functionally, land use policies such as growth limits in flood zones or shoreline acquisition at fair market value in areas subject to flooding are not emphasized. Though BAU has often been questioned by some stakeholders who heavily use beach-associated resources but don't have beachfront property, beach management in the state appears to show little adaptive capacity beyond dredging and armoring, as evidenced in part by the relative absence of climate change planning.

4.6. Opportunities for expanded policy research

It is important to note that the independent journal literature on the institutional structure and perceptions of beach management in Florida is very limited. There was little precedent for this study and there were limitations that we hope will be addressed in future

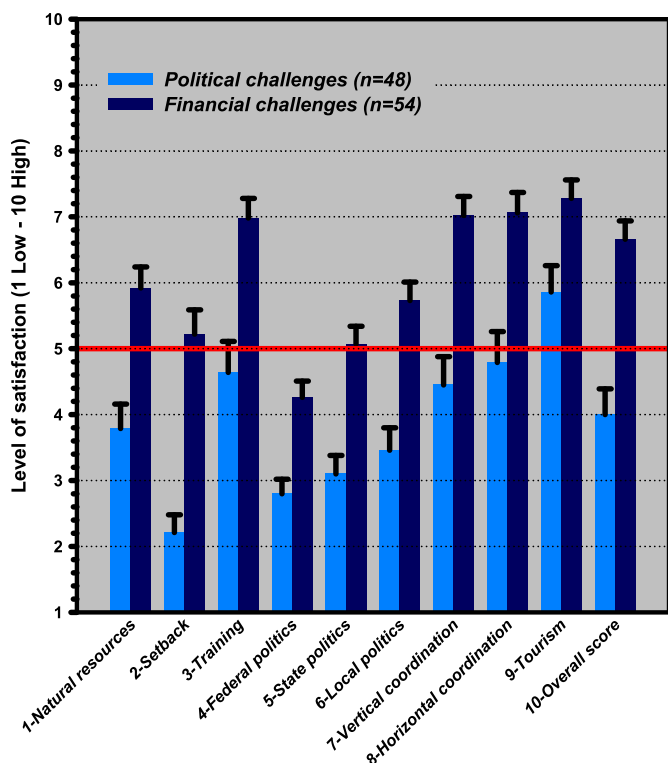


Fig. 7. Major obstacles in addressing the challenges of beach management. Notes: 1. Natural resources = Do you think that the management of natural resources of beaches is adequate? 2. Setback = Do you think that the setback line is effective for protecting beaches and dunes? 3. Training = Do you think that academic and professional training is adequate for educating future beach managers and stakeholders? 4. Federal politics = Do you think that Federal politician take the best decisions for beach management? 5. State politics = Do you think that State politicians take the best decisions for beach management? 6. Local politics = Do you think that Local politicians take the best decisions for beach management? 7. Vertical coordination = Do you think that beach management in your county is well-coordinated among federal-state and local managers? 8. Horizontal coordination = Do you think that beach management in your county is well-coordinated among different departments, institutions and stakeholders involved in beach management at the local level? 9. Tourism = Do you think tourism is well managed in your county (plans, number of tourists present, interaction with the environment, etc.)? 10. Overall score = Overall are you satisfied with beach management in your county?

independent policy studies of this type. These limitations include: a) some survey questions were very general in nature and stakeholders may have given the same response for different reasons (i.e., dissatisfaction with a policy option may be caused by different reasons), b) different combinations of questions and answer opportunities could have been deployed, and c) sample size was variable and limited for some stakeholder groups (e.g., 37 for local managers and 5 for federal managers), though sample sizes appeared to have little precedent for many individual stakeholder groups.

The survey instrument and interview protocol allowed us to comparatively explore beach management among stakeholders using a state-wide, multi-stakeholder perspective. These results can help advance future policy research into one of the most important and independently understudied coastal areas in the U.S. There are many opportunities to further detail patterns among Florida stakeholders and regions, extend comparisons with other national and international coastal areas, and lead to a better understanding of the factors that affect policy decisions.

5. Conclusions

We studied stakeholder perspectives on many primary beach management issues in the state of Florida, United States. Stakeholders were moderately satisfied with many operative aspects of beach management and significantly valued some measures that are in place to adapt to storms and hurricanes. However, many stakeholders showed dissatisfaction with other important elements of management including political processes, stakeholder representation, reactive planning, and tenuous control of construction on beach systems. Many of the factors rated as moderate or poor were of highest relative importance to overall satisfaction of the stakeholders.

Stakeholder groups considered erosion and management of natural resources to be the most important conflicts. One-third of the stakeholders were not concerned about the future effects of sea level rise. Regarding technical solutions to handle erosion, stakeholders generally valued renourishment more than armoring, although opinions on the effectiveness of renourishment were highly polarized. Results showed the need to ensure social equity in policy participation, independently assess environmental impacts and evaluate long term threats in manners that are not driven only by short-term considerations.

The independent journal literature on applied coastal policy in Florida is very limited and additional studies that expand our knowledge of beach management institutions and policy trajectories are needed. Diverse components of social capital should be considered more explicitly in the management of beaches. Though technology has had various positive effects on beach management in the State, its roles must be realistically gauged against the increasing probability of SLR, environmental impacts, social equity in policy participation, and a decrease in once abundant subsidies for development in flood zones.

Ethical statement

Research done in this manuscript is original. Data presented has been obtained following rigorous methods and results have not been being altered. This manuscript has not been intended for publication anywhere else.

Acknowledgments

The first author was supported by a Fulbright Fellowship from the Fulbright Commission and acknowledges the support provided

by Stephen P. Leatherman. The authors wish to sincerely thank all respondents who participated in the survey, the interviews, and the four anonymous reviewers. Meenakshi Jerath and Morgan Wilson contributed to the final edits of the manuscript. Lauren Dame, Haiyun Yu, and Bryce Beard assisted with literature searches. Ken Lindeman was supported by a grant from the NOAA Climate Office and Ben Horton, Rutgers University. Pallab Mozumder acknowledges support from the National Science Foundation (EAR-1204762).

References

- Ariza, E., Jiménez, J.A., Sardá, R., 2008. A critical assessment of beach management on the Catalan coast. *Ocean. Coast. Manag.* 51, 141–160.
- Ariza, E., Jiménez, J.A., Sardá, R., Villares, M., Pintó, J., Fraguell, R., Roca, E., Martí, C., Valdemoro, H., Ballester, R., Fluvià, M., 2010. Proposal for a beach integral quality index for urban and urbanized beaches. *Environ. Manag.* 45 (5), 998–1013.
- Arnold, C.A., 2011. Legal castles in the sand: the evolution of property law, culture, and ecology in coastal lands. *Syracuse Law Rev.* 61, 999–1046.
- Bagstad, K.J., Stapleton, K., D'Agostino, J.R., 2007. Taxes, subsidies, and insurance as drivers of United States coastal development. *Ecol. Econ.* 63, 285–298.
- Baruch, Y., 1999. Response rate in academic studies – a comparative analysis. *Hum. Relations* 52 (4), 421–438.
- Beatley, T., Brower, D.J., Shwab, A.K., 2002. *An Introduction to Coastal Zone Management*. Island Press, Washington, D.C.
- Beever III, J.W., Gray, W., Trescott, D., Cobb, D., Utley, J., Hutchinson, D., Gibbons, J., Walker, T., Abimbola, M., Beever, L.B., Ott, J., 2009. City of Punta Gorda Adaptation Plan. Southwest Fl. Reg. 09-4. Planning Council and Charlotte Harbor Nat. p. 409. Estuary Prog. Technical Report.
- Bishop, M.J., Peterson, C.H., Summerson, H.C., Lenihan, H.S., Grabowski, J.H., 2006. Deposition and long-shore transport of dredge spoils to nourish beaches: impacts on benthic in fauna of an ebb-tidal delta. *J. Coast. Res.* 22 (3), 530–546.
- Bronzizio, E.S., Ostrom, E., Young, O.R., 2009. Connectivity and the governance of multilevel social-ecological systems: the role of social capital. *Annu. Rev. Environ. Resour.* 34, 253–278.
- Brulle, R.J., 2000. Agency, Democracy, and Nature. *The US Environmental Movement from a Critical Theory Perspective*. The MIT Press, Cambridge, Massachusetts.
- Bryman, A., 2012. *Social Research Methods*. Oxford University Press.
- Bush, D.M., Longo, N.J., Neal, W.J., Esteves, L.S., Pilkey, O.H., Pilkey, D.F., Webb, C.A., 2001. *Living on the Edge of the Gulf*. The West Florida and Alabama Coast. Duke University Press, Durham and London.
- Bush, D.M., Neal, W.J., Longo, N.J., Lindeman, K.C., Pilkey, D.F., Esteves, L.S., Congleton, J.D., Pilkey, O.H., 2004. *Living with Florida's Atlantic Beaches*. Coastal Hazards from Amelia Island to Key West. Duke University Press, Durham and London.
- CCS (Center for Climate Strategies), 2008. *Florida's Energy and Climate Change Action Plan*. Governor's Action Team on Energy & Climate Change, p. 609.
- Cicin-Sain, B., Knecht, R., 1998. *Integrated Coastal and Ocean Management: Concepts and Practices*. Island Press, Washington, DC.
- Cheong, S., 2011. Policy solutions in the US. *Clim. Change* 106, 57–70.
- Christie, D.R., 2009. Of beaches, boundaries, and SOBs. *J. Land Use Environ. Law* 25 (19), 19–75.
- Cooper, J.A.G., McKenna, J., 2008. Social justice in coastal erosion management: the temporal and spatial dimensions. *Geoforum* 39 (1), 294–306.
- Cooper, J.A.G., Anfuso, G., Del Rio, L., 2009. Bad beach management: European perspectives. *Geol. Soc. Am* 460, 2009. Special paper.
- Crawford, S.E.S., Ostrom, E., 1995. A grammar of institutions. *Am. Polit. Sci. Rev.* 89, 582–600.
- Dean, C., 1999. *Against the Tide*. The Battle for America's Beaches. Columbia university Press, New York.
- Defeo, O., McLachlan, A., Schoeman, D.S., Schlacher, T.A., Dugan, J., Jones, A., Lastra, M., Scapini, F., 2009. Threats to sandy beach ecosystems: a review. *Estuarine. Coast. Shelf Sci.* 81 (1), 1–12.
- Estevez, E.D., 1990. Perceptions of risk in Florida's local governments resulting from Sea Level Rise. In: Burrage, D.D. (Ed.), *Long term implications of Sea Level Change for the Mississippi and Alabama coastlines*. Mississippi-Alabama Sea Grant Consortium, pp. 87–101.
- Farrell, K.N., 2009. *Making Good Decisions Well*. A Theory of Collective Ecological Management. Shaker Verlag, Germany.
- Honey, M., Rome, A., 2001. *Protecting Paradise: Certification Programs for Sustainable Tourism and Ecotourism*. Institute for Policy Studies, p. 114.
- Houston, J.R., 2008. The economic value of beaches – a 2008 update. *Shore Beach* 76 (3).
- Jacques, P.J., Dunlap, R.E., Freeman, M., 2008. The organization of denial: conservative think tanks and environmental skepticism. *Environ. Polit.* 17 (3), 349–385.
- James, R.J., 2000. From beaches to beach environments: linking the ecology, human-use and management of beaches in Australia. *Ocean. Coast. Manag.* 43 (6), 495–514.

- Janssen, M.A., Ostrom, E., 2006. Empirically based, agent-based models. *Ecol. Soc.* 11 (2), 37.
- Jasanoff, S., 2007. Technologies of humility. *Nature* 450, 33.
- Krantz, E., June 2009. Sand for the people. *Fla. Bar J.*, 11–21.
- Lindeman, K.C., Snyder, D.B., 1999. Nearshore hardbottom fishes of southeast Florida and effects of habitat burial caused by dredging. *Fish. Bull.* 97, 508–525.
- Lindeman, K.C., Tripp, J.T.B., Whittle, D.J., Moulart-Quiros, A., Stewart, E., 2003. Sustainable coastal tourism in Cuba: roles of environmental impact assessments, certification programs, and protection fees. *Tulane Environ. Law J.* 16, 591–618.
- Lindeman, K.C., Gibson, H.T., Yu, H., 2010. Participatory climate adaptation in coastal Florida: increasing roles for water-users and independent science. In: *Proc. 62nd Gulf and Caribbean Fisheries Institute*, 62, pp. 7–11.
- Micallef, A., Williams, A., 2002. Theoretical strategy considerations for beach management. *Ocean. Coast. Manag.* 45 (4–5), 261–275.
- Mozumder, P., Flugman, E., Randhir, T., 2011. Adaptation behavior in the face of global climate change: survey responses from experts and decision makers serving the Florida Keys. *Ocean. Coast. Manag.* 54, 37–44.
- Murray, G., 2007. Constructing paradise: the impacts of big tourism in the Mexican coastal zone. *Coast. Manag.* 35 (2–3), 339–355.
- National Public Radio (NPR), 2013. In Miami, a new Condo Boom Revives Hopes of Housing Recovery. <http://www.npr.org/2013/02/22/172602696/in-miami-a-new-condo-boom-revives-hopes-of-housing-recovery>.
- Nelson, W.G., 1989. Beach nourishment and hard bottom habitats: the case for caution. *Beach Preservation Technology* '89, pp. 109–116.
- NOAA 2010. Accessed Nov 4, 2012. http://stateofthecoast.noaa.gov/coastal_economy/welcome.htm.
- Norgaard, R.B., 1994. *Development Betrayed. The End of Progress and a Coevolutionary Revisioning of the Future*. Routledge, New York.
- Ostrom, E., 1990. *Governing the Commons. The Evolution of Institutions for Collective Action*. Cambridge University Press, New York.
- Ostrom, E., 2010. A long polycentric journey. *Annu. Rev. Polit. Sci.* 13, 1–23.
- Peterson, C.H., Hickerson, D.H.M., Johnson, G.G., 2000. Short-term consequences of nourishment and bulldozing on the dominant large invertebrates of a sandy beaches. *J. Coast. Res.* 16 (2), 368–378.
- Peterson, C.H., Bishop, M.J., 2005. Assessing the environmental impacts of beach nourishment. *Bioscience* 55 (10), 887–896.
- Phillips, M.R., Jones, A.L., 2006. Erosion and tourism infrastructure in the coastal zone: problems, consequences and management. *Tour. Manag.* 27 (3), 517–524.
- Pilkey, O.H., Dixon, K.L., 1996. *The Corps and the Shore*. Island Press, Washington DC.
- Pilkey, O.H., Young, R., 2009. *The Rising Sea*. Island Press, Washington DC.
- Rahmstorf, S., 2010. A new view on sea level rise. *Nat. Reports Clim. Change* 4, 44–45.
- Rittel, H.W.J., Weber, M.M., 1973. Dilemmas in a general theory of planning. *Policy Sci.* 4, 155–169.
- Roca, E., Villares, M., 2008. Public perceptions for evaluating beach quality in urban and semi-natural environments. *Ocean. Coast. Manag.* 51, 314–329.
- Ruppert, T.K., June 2008. Eroding long-term prospects for Florida's beaches: Florida's coastal construction control line program. *Sea Grant Law Policy J.* 1 (1).
- Sanò, M., Jiménez, J.A., Medina, R., Stanica, A., Sanchez-Arcilla, A., Trumbic, I., 2011. The role of coastal setbacks in the context of coastal erosion and climate change. *Ocean. Coast. Manag.* 54 (12), 943–950.
- Shipman, B., Stojanovic, T., 2007. Facts, fictions, and failures of integrated coastal zone management in Europe. *Coast. Manag.* 35 (2–3), 375–398.
- Shivlani, M.P., Letson, D., Theis, M., 2003. Visitor preferences for public beach amenities and beach restoration in South Florida. *Coast. Manag.* 31 (4), 367–385.
- SFRCCC-TAWG (Southeast Florida Regional Climate Change Compact Technical ad hoc Work Group), 2011. A Unified sea Level Rise Projection for Southeast Florida. Report for the Southeast Florida Regional Climate Change Compact Steering Committee, pp. 27–34.
- Strauss, B.H., Tebaldi, C., Ziemlinski, R., 2012a. Surging sea's: sea Level Rise, Storms, and Global Warming's Threats to the U.S. Coast, p. 13. Climate Central Report.
- Strauss, B.H., Ziemlinski, R., Weiss, J.L., Overpeck, J.T., 2012b. Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States. *Environ. Res. Lett.* 7 (1).
- Stronge, W., 2004. The Economics of beach tourism in Florida. Prepared for Florida Department of Environmental Protection, Bureau of Beaches and Coastal Systems. Florida Atlantic University, p. 77.
- Tebaldi, C., Strauss, B.H., Zervas, C.E., 2012. Modeling sea level rise impacts on storm surges along US coasts. *Environ. Res. Lett.* 7 (1).
- Wanless, H.R., Maier, K.L., 2007. An evaluation of beach renourishment sands adjacent to reefal settings, Southeast Florida. *Southeast. Geol.* 45 (1), 25–42.
- Wanless, H.R., 2009. A history of poor economic and environmental renourishment decisions in Broward County, Florida. *Geol. Soc. Am. Special Paper* 460, 111–119.
- Williams, A.T., Micallef, A., 2009. *Beach Management. Principles & Practices*. Earthscan, London, UK.