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Managing for diverse coastal uses and values under sea level rise: perspectives from Oʻahu, Hawaiʻi

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ABSTRACT

Effective and equitable coastal decision-making under sea level rise (SLR) requires managing for multiple coastal uses and values. This study explores how coastal decision-makers in Hawaiʻi perceive diverse uses and values of beaches and coastlines to be important and how they see recognition of these uses and values ideally shaping SLR response. We conducted 42 interviews and 37 surveys with representatives from government, private, and civil society organizations involved with coastal decision-making across the state. To understand how perspectives change based on localized contexts, we grounded our conversations around three socio-ecologically distinct communities on the island of Oʻahu: Kaʻaʻawa, Sunset Beach, and Kāhala. We found broad agreement across decision-maker groups and sites in the perception that current coastal management decisions prioritize private and monetary (particularly real estate) values over diverse social and ecological values, often to the detriment of beaches and coastal communities. Though participants generally agreed on the need for new policy and management approaches that promote protection of relational and other non-monetary values of beaches to diverse communities, interviewees held markedly different perceptions over whether, and the extent to which, sustaining beaches under SLR necessitates tradeoffs in maintaining private property claims. Results highlight the importance of approaching SLR adaptation with an appreciation of multiple and place-based uses and values; and of developing processes to build a shared understanding among distinct actor groups and value systems of the tradeoffs inherent in SLR response.

1. Introduction

The 2021 Intergovernmental Panel on Climate Change Sixth Assessment Report (AR6) concludes that it is "virtually certain" that global mean sea level rise (SLR) will continue to rise through the end of this century (Lee et al., 2021, p. 4–30). As such, SLR presents an accelerating threat to beaches and coastal communities around the world (Defeo et al., 2009; Arkema et al., 2013; Neumann et al., 2015). The diversity of possible SLR responses—generally encompassed by the protect, accommodate, or retreat framework (IPCC, 1990; Dedekorkut-Howes et al., 2020)—have dramatic impacts on the ways that people use and value beaches and coastlines. For example, while adaptation-in-place (e.g. through coastal hardening) often degrades public coastal resources by inhibiting natural inland migration of the coastline (Defeo et al., 2009; Tavares et al., 2020), it can also support continued access and relationships to beaches and coastlines by protecting coastal residences and transportation networks. Adaptation-in-place can also temporarily mitigate private property losses while longer-term solutions are sought. However, the long-term risks of SLR mean that short-term responses can create lock-in that limits future opportunities to adapt in ways that better incorporate multiple priorities (Abel et al., 2011; Haasnoot et al., 2019). Similarly, while retreat from coastlines can exacerbate inequities (Nurhidayah and McIlgorm, 2019) and threaten sovereignty and connection to place,

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particularly in areas like small islands where relocation options are limited (Bordner et al., 2020), in other contexts retreat can also help to maintain coastal resources as sites of cultural identity, subsistence activity, and recreational value.

Among these options, adaptation-in-place in response to SLR and coastal flooding has been the predominant strategy (Dedekorkut-Howes et al., 2020). This default response is reflective of path-dependent development patterns and legal frameworks that favor private property while overlooking public access to and use of sandy beaches (Abel et al., 2011). In this context, there is need for more discussion on how coastal management actions shape short- and long-term values of beaches and coastlines, and what prompts these value-laden choices (Siders and Keenan, 2020). It is important to take a holistic perspective of SLR response impacts such that actions can more effectively and equitably attend to diverse societal objectives (Mach and Siders, 2021).

While beach management studies have long aimed to characterize beach uses and values to understand their "importance" (Leatherman, 1997; Lucrezi et al., 2016; Morgan, 1999; Vaz et al., 2009), these studies have been used largely for the purpose of improving recreational user experiences and to enhance the economic value of tourism (Maguire et al., 2011). Early beach rating schemes, for example, focused on criteria relating to safety, water quality, facilities, scenery and litter (Leatherman, 1997; Vaz et al., 2009). However, this narrow view of the importance of beaches tips decision-making in favor of actions that protect monetary values that can be in conflict with, for example, ecological impacts or spiritual value for local communities (Micallef and Williams, 2003). Accordingly, there are calls for the inclusion of a broader set of social values within beach management that extend to ecological, socio-cultural, and relational considerations (Everard et al., 2010; Lucrezi et al., 2016).

Such calls also echo efforts to move environmental valuation studies from a singular valuation approach (e.g. either from utilitarian economic or intrinsic value perspectives) towards a "value pluralism lens" in which the multiple ways that people value nature (i.e. relate to or ascribe importance to) are incorporated into planning and decision-making (Pascual et al., 2017: 9; Díaz et al., 2015; Hill et al., 2021; Gould, 2022; Tadaki et al., 2017; IPBES, 2015). According to such perspectives, ecosystems, including coastlines and beaches, can be conceptualized both for instrumental benefits (e.g. in terms of the economic value of biodiversity maintenance and coastal protection from storms or the capacity of coasts to support tourism or food cultivation) as well as for their relational importance (e.g. as homes, sites of identity and meaning, and places where cultures of coastal cultivation, recreation, and stewardship reflect diverse value structures and practices of knowing ecosystems; Norgaard, 2010; Pascual et al., 2017; Chan et al., 2016).

The Hawaiian Islands offer an important model case to understand how diverse uses and values of beaches and coastlines are currently incorporated into SLR response strategies as well as how they can potentially be better included. Hawai'i's coastlines have considerable ecological, socio-cultural, and economic importance (Needham et al., 2008; Penn et al., 2016; Peng and Oleson, 2017; Morishige et al., 2018; Vaughan, 2018; Ingram et al., 2020), and are threatened by elevated rates of coastal erosion under SLR (Summers et al., 2018; Tavares et al., 2020). Relational values or values that arise from relationships with nature (Chan et al., 2016, 2018), are particularly important in the context of Hawai'i and Native Hawaiian lifeways and culture (Pascua et al., 2017; Vaughan, 2018; Gould et al., 2019; Kealiikanakaoleohaililani et al., 2018; Montgomery and Vaughan, 2018). In this study we draw on inclusive valuation (i.e. Díaz et al., 2015; Pascual et al., 2017) to explore the ways that government, private, and civil society actors involved with coastal management and decision-making in Hawai'i perceive beaches and coastlines to be important for diverse actors, as well as their perceptions on how these uses and values should ideally be prioritized in designing appropriate SLR response.[1]

Through surveys and interviews, we gather perspectives on values, strategies, and opportunities in maintaining and enhancing the plural values of beaches and coastlines in Hawai'i in the context of SLR. To understand how perspectives change based on localized contexts, we ground our conversations around three socially and biophysically distinct coastal communities on the island of O'ahu: Ka'a'awa, Sunset Beach, and Kāhala. We focus on the following questions in relationship to the three geographic focal areas:

(i) What uses and values of beaches and coastlines do government, private, and civil society actors identify as currently important for coastal communities and stakeholders?;
(ii) Which uses and values do these actors see as ideally shaping decision-making around SLR adaptation?; and
(iii) What conflicts related to these uses and values are emerging in relation to SLR and SLR response?

We find general agreement that current tendencies, by default, prioritize private and monetary (particularly real estate) values over a broader set of ecological and relational values. This trend has, and will continue to degrade the quality of beaches which underpin much of the people of Hawai'i's culture, identity, way of life, and economy. We demonstrate the importance of approaching SLR adaptation with an appreciation of multiple, place-based values, and developing processes to build a shared understanding among distinct actor groups and value systems of tradeoffs inherent in SLR response. Future participatory work on place-based uses and values from the perspective of residents, those with ancestral ties, and other community members will usefully complement the present study focused on government, private, and civil society actors to achieve more effective and equitable SLR response.

2. Background

2.1. Coastal Governance in Hawai'i

Beaches in Hawai'i are legally classified under the Hawai'i State Constitution as a public trust resource. Hawai'i's public access laws establish that beach transit corridors must be maintained such that there be adequate public right-of-way through and along the shoreline area (HRS § 115). Hawai'i's constitutional interpretation of the public trust doctrine is directly linked to Native Hawaiian traditional and customary law (Sproat, 2009). Under the public trust, Native Hawaiians have additional rights that grant access to beaches and shorelines for traditional and customary practices even if such action means traversing through private property (Harris, 1997). While private development is allowed along the coastline, it is not meant to impede the preservation of public trust resources or those tied to customary uses (Harris, 1997, p.

[1] A broad range of actors and institutions influence coastal decision-making, from residents and community groups to donors and philanthropic organizations. We focus on government, private, and civil society actors directly involved in coastal management in each of the three study locations. This focus represents their significance to current and future decision-making surrounding coastal management, as well as the difficulties of more closely engaging a more diverse range of actors (e.g., residents, community members, neighborhood councils) during the COVID-19 pandemic.

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Hawai'i's Coastal Zone Management Act (CZMA) identifies the shoreline as the highest annual reach of the wash of seasonal waves and establishes a minimum setback 40-feet from the shoreline (HRS § 205A). Though the State CZMA grants counties authority to increase the shoreline setback, the City and County of Honolulu has maintained the state's minimum standard (ROH § 23). With exacerbated SLR, unhardened shorelines are expected to continue migrating landward. Though this could be interpreted as a form of rolling easement, meaning that private property is yielded to the state with the landward migration of the shoreline (Chin, 2017), variances that allow for shoreline hardening were historically granted on the grounds of economic hardship (Summers et al., 2018). More recently, temporary erosion control measures (such as large sand bags and geotextile blankets) have become seemingly permanent fixtures (Cocke, 2020a). These dynamics are consistent with a long history of shoreline hardening that has enabled private coastal development while also causing substantial beach loss (Wiegel, 2008; Summers et al., 2018; Tavares et al., 2020).

Seventy percent of beaches on the islands of O'ahu, Maui, and Kaua'i are already experiencing chronic coastal erosion due to SLR and sediment deficiencies, which in turn prompts property owners to protect their properties through coastal hardening (Fletcher et al., 2012). These challenges are enhanced by continued SLR and coastal development (Andersen et al., 2018; Tavares et al., 2020). Over 60% of O'ahu's beaches are currently eroding, and with 0.25 - 0.74m of SLR this number is projected to increase to 80% and 89%, respectively, by 2050 (Tavares et al., 2020). In addition to coastal erosion, SLR exacerbates other coastal hazards such as increased wave inundation, passive flooding, groundwater inundation, and intensified impacts from storm surges (Fletcher et al., 2012; Anderson et al., 2018; Hawai'i Climate Change Mitigation and Adaptation Commission, 2021; Vitousek et al., 2017b).

While continued beach loss raises questions about the future of coastlines and the efficacy of CZM approaches in Hawai'i to date, Hawai'i also remains at the forefront of climate adaptation efforts. Examples include the establishment of state and city commissions on climate change and a recent commitment by the Honolulu City and County Mayor's office to make SLR a major focus of planning (City and County of Honolulu, 2018). In addition, updates to the CZMA make variances for seawall construction within setback zones considerably more difficult to obtain. There were important recent amendments to the CZMA that prohibit construction of private shoreline hardening and minimizing public shoreline hardening where there is sandy beach and where structures interfere with existing recreational and waterline activities (Act 16, 2020). Where prior state and county CZM policies narrowly differentiated place-based interventions only based on the presence of a sandy beach (i.e. without any distinction between uses and characteristics of particular sandy beaches), this update expands consideration to the presence of public infrastructure. There was also passage of a mandatory real estate disclosure law for property transactions within "SLR Exposure Areas" that goes into effect in May 2022 (Act 179, 2021).[2] Public pressure to limit the use of so-called temporary erosion control measures (like geotextile materials to hold sand in place) that result in long-term beach loss is also mounting (Cocke, 2020a, 2020b, 2021), and both state and county entities have contemplated increasing the coastal setback to better account for SLR (Lovell, 2020; Lyte, 2021).

These legal and regulatory contexts imply that contemporary coastal governance in Hawai'i necessarily encompasses a complex and dynamically shifting web of government, private sector, and civil society actors and institutions. Key government institutions include the Hawai'i State Office of Planning and the Hawai'i State Department of Land and Natural Resources - Office of Conservation and Coastal Lands; state agencies tasked with implementing the Coastal Zone Management Act (CZMA); and county planning departments that review and issue permits in coastal zones and special management areas, which include shoreline setback areas. On O'ahu this country department is the City and County of Honolulu Department of Permitting and Planning. Given the linkages between Hawai'i's public trust doctrine and Native Hawaiian rights and practices, state agencies including the Department of Hawaiian Homelands and the Office of Hawaiian Affairs are also important. Private sector stakeholders that heavily play into coastal management and governance processes include landowners and those from the real estate and development industry, including realtor, architectural, and construction associations. There is also substantial involvement in coastal governance from civil society actors, including non-profits interested in coastal activities, as well as place-based organizations more focused on community-beach relations and environmental stewardship. Such actors often engage in the decision-making process through government processes of consultations, including direct testimony (Cocke, 2020b).

3. Methods

3.1. Survey and interview

We conducted semi-structured interviews with 42 key actors involved in coastal management and decision-making including: government (n = 14), private (n = 12), and civil society (n = 16) actors. Interviews were carried out from June 2020 and January 2021 and, due to the global pandemic, all interviews were conducted remotely on Zoom. Prior to the interviews, we asked participants to fill out an online survey. The survey was completed by 37 participants (12 of 14 government, 12 of 12 private, and 13 of 16 civil society actors).

Participants were selected on the basis of their involvement in coastal, beach, and nearshore infrastructural management, protection, and decision-making. Government actors included representatives from the state (n = 9) and county (n = 5) including planning, permitting, environmental management and infrastructure departments and agencies that operate in the coastal zone. Private sector actors included planning, architectural and engineering firms (n = 8), real estate industry associations (n = 2), an attorney specializing in coastal management, and a representative of the tourism industry. Civil society included non-profit and community groups engaged in place-based management and stewardship (n = 3), as well as more regionally focused affinity groups motivated by shared uses of beaches and coastlines that also held additional legal perspectives (n = 13). Fourteen participants (three government, five private, and six civil society representatives) expressed being intimately familiar with one or more of the study sites because they either currently or previously resided in the areas, have family connections to or frequently recreate within one of the areas.

We drew on diverse conceptualizations of beach and other ecosystem uses and values to develop those identified in our survey instrument and interview guide (Table 1). The uses and values assessed were identified using existing Hawai'i-based peer-reviewed scholarship and policy documents as well as our own experiences in Hawai'i (see references in Table 1). The uses and values, many of which are inherently overlapping, were selected to encompass a range of activities and relationships to coastlines that implicate varying impacts of SLR and coastal hardening. Our distinction between onshore versus nearshore recreational and subsistence activities denotes whether these activities require a sandy beach (onshore) or do not (nearshore).

The survey was composed of Likert and rank order questions to quantify perspectives of site-specific beach uses and values (Table 2), and how these might change relative to further SLR and SLR response. Open-ended responses were also allowed, to collect information on additional uses and values that were not pre-identified. Interview questions were designed to follow up or clarify participants survey

[2] SLR Exposure Areas are mapped areas that are defined as those that stand to be affected by ~1 m of SLR across the Hawaiian Islands, taking into account important interactions like seasonal high wave run-up.

Table 1
Beach and coastline uses and values included in survey.

Use/Value	Example uses and values	References
Ecological functions and habitat	monk seal resting and birthing; turtle basking and nesting; limu; bird nesting	Friedlander and Parrish, 1998; Kane et al., 2015; Abbott, 1984
Tourism	use by visitors; destination photos	State of Hawai'i Office of Planning, 2019; Hawai'i Climate Change Mitigation and Adaptation Commission, 2017
Real estate values	market valuation of coastal properties	Hawai'i Climate Change Mitigation and Adaptation Commission, 2017
Nearshore subsistence	trolling; spear fishing; lay net	McMillen et al., 2016; Vaughan and Vitousek, 2013
Onshore subsistence	shoreline pole casting; throw net; hukilau; limu gathering	Vaughan and Vitousek, 2013; Vaughan, 2018; Winter et al., 2020
Nearshore recreation	surfing; swimming; snorkeling	Peng and Oleson, 2017; Oleson et al., 2020; Penn et al., 2016
Onshore recreation	sunbathing; walking; picnics	Oleson et al., 2020; Penn et al., 2016
Aesthetic/scenic beauty	clear water; sandy beaches	Ingram et al., 2020; Leong et al., 2019
Spiritual and cultural significance	connection to place; *kilo* (observation); identity; practitioner gathering	Pascua et al., 2017; Ingram et al., 2020; Leong et al., 2019; Morishige et al., 2018; Puniwai, 2015; Gould et al., 2020
Historical significance	heritage	Ingram et al., 2020; Leong et al., 2019; Winter et al., 2020

responses and, where no survey responses had been recorded, to qualitatively gather information on the uses and values of greatest importance to those actors. Interviews ranged from approximately 60-90 minutes, and employed open-ended questions intended to more deeply probe why participants had prioritized certain uses and values (e.g., on the basis of personal or professional histories and experiences, or in relation to uneven positionalities and social locations). Open-ended questions also gauged participants' perceptions of how place-based distinctions could be incorporated into future and ongoing coastal management decisions, and potential challenges therein. The survey and interview questions, organized by our three research questions, are shown in Table 2.

Table 2
Survey and interview questions

Question	Instrument	Format
Research question 1: *What uses and values of beaches and coastlines do government, private, and civil society representatives identify as currently important for coastal communities and stakeholders?*		
We are interested in understanding what is currently important within beaches and coastal communities, using the three study sites as examples. Please provide your input as to their current relative importance in each place [Kāhala, Sunset Beach, Ka'a'awa]. **See Table 1 for uses and values and examples given in survey*	Survey	Likert-scale
What do you see as the most important ecological, cultural, and economic uses and values for each of these coastal areas [Sunset Beach, Ka'a'awa, and Kāhala]?	Interview	Open-ended
Research question 2: *Which uses and values do representatives see as ideally shaping decision-making around SLR adaptation?*		
We are interested in understanding how the important aspects of beaches and coastal communities should ideally be used in coastal decision-making related to sea level rise for each study site. Please help us prioritize the following statements as ideally important for decision-making related to sea level rise for each place [Sunset Beach, Ka'a'awa, Kāhala].	Survey	Likert-scale; rank order *(limit 2 in each prioritization category)*
Which of these uses and values do you see as most important to protect/save/maintain under sea level rise in each place [Sunset Beach, Ka'a'awa, Kāhala]?	Interview	Open-ended
How can site-specific characteristics be incorporated into decision-making for sea level rise adaptation?	Interview	Open-ended
Research question 3: What conflicts related to these uses and values are emerging in relation to SLR and SLR response?		
Do you see any potential social or environmental justice challenges emerging from these management approaches? Are there existing conflicts that could be exacerbated?	Interview	Open-ended

3.2. Data analysis

We used descriptive statistics (within-group and site-based means and standard deviations (SD)) from survey data to discuss trends within- and across-group tendencies for the first two research questions (i.e. which uses and values are identified as important and which uses and values should ideally be prioritized for decision-making). We do not report statistical differences across groups and sites in recognition of our relatively small sample size. We used spider diagrams (Howse et al., 2005) to visualize the varying levels of ascribed current importance versus ideal prioritization across value categories. Interviews were audio-recorded and transcribed and used to contextualize the quantitative results from the first two research questions and explore the third research question on emerging conflicts (Table 2). We used deductive coding to group interview responses and direct quotes based on predefined research questions and also organized quotes within the third research question by emergent themes.

3.3. Site descriptions

To understand how perspectives might change based on place-based values, we grounded the survey and interviews within three distinct areas: Sunset Beach, Ka'a'awa, and Kāhala (Fig. 1; Table 3[3]). These communities are governed under the same state and county policy frameworks but exhibit variation in historical context, community social and economic characteristics, population density, real estate values, geology, exposure to natural hazards, beach and ecological resources, and visitor and resident usage patterns.

3.3.1. Sunset Beach

The area known as Sunset Beach, a wide sandy shoreline of about 1.6 km, is part of the famed North Shore of O'ahu. Historical *mo'olelo* (stories) describe the area as having significant nearshore fisheries, as well as an important surfing area (Green and Pukui, 1936; Graves and McElroy, 2016; McAllister, 1933). Sunset Beach remains an important recreational beach for local residents, the broader O'ahu community, and tourists (Fig. 1a; Fig. 2). At Sunset Beach Park, the coastal highway sits atop a large beach dune with a wide and dynamic sandy beach in front. There is considerable chronic and seasonal beach erosion that

[3] U.S. Census Bureau American Community Survey (2019), Census tract 101: Waimea-Kahuku, Census tract 102.01: Hauula-Kaaawa, and Census tract 5: Waialae-Kahala.

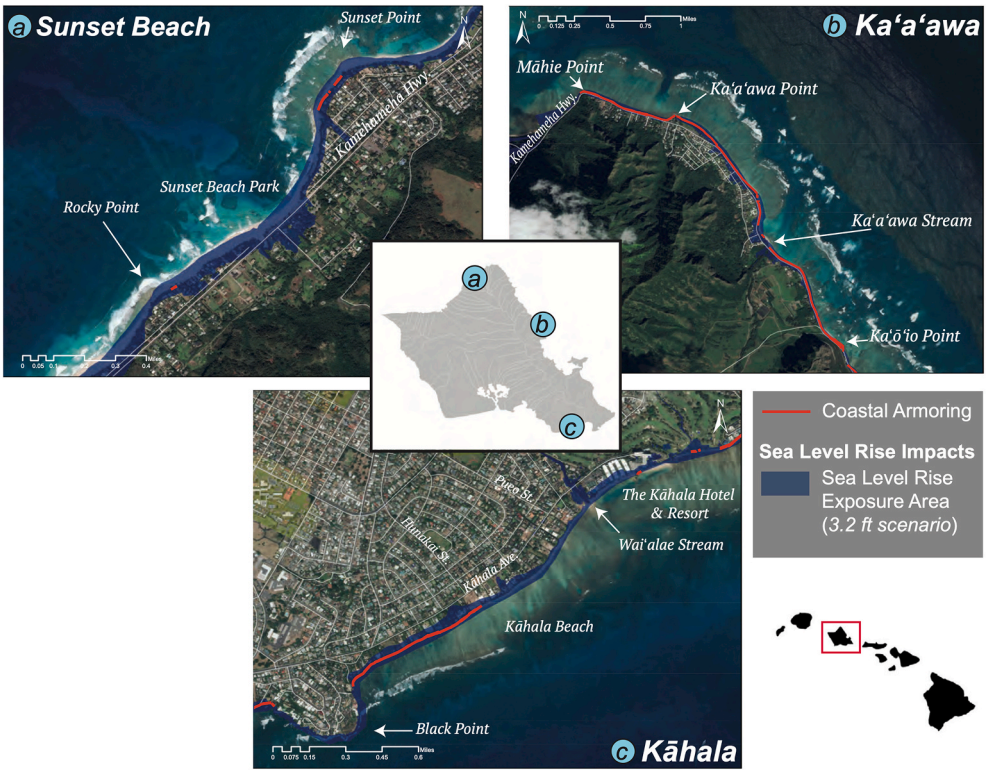

Fig. 1. (a) Sunset Beach, (b) Kaʻaʻawa, and (c) Kāhala study sites. Expected inundation from 1-meter of SLR is shown in blue and known existing coastal armoring (i.e. seawalls) as red lines. Flood exposure is still likely in areas with seawalls (Habel et al., 2020). Data Sources: Amaya et al. (2021), Hawaiʻi Climate Change Mitigation and Adaptation Commission (2021). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

imminently threatens approximately twenty residences and has triggered emergency and other temporary fortification measures, mainly in the form of sand pushing and "soft" seawalls composed of geo-textile materials (Cocke, 2014, 2020a; Onat et al., 2018). Recently, a beachfront home collapsed onto the beach after its foundation was destroyed by a winter storm swell, intensifying the urgency of the situation (Honolulu Star-Advertiser, 2022).

3.3.2. *Kaʻaʻawa*

Kaʻaʻawa is on the northeast coast of Oʻahu and spans approximately 3.1 km of shoreline (Fig. 1b; Fig. 3). Kaʻaʻawa has the highest Native Hawaiian and Pacific Islander population (53.4%) and the lowest real estate values and median household income among the study sites (U.S. Census Bureau, 2019, Table 3). Historically, Kaʻaʻawa had extensive irrigated *kalo* (taro; a staple root crop within the Native Hawaiian diet) along streams and marshy grounds (Handy, 1940). Today, the community consists of homes on either side of Kamehameha Highway, which has become a de facto ocean revetment in this area due to chronically eroding beaches.

Emergency measures are frequently taken to secure the coastal road, which often experiences overtopping waves and impassable driving conditions. The road has crumbled in critical sections near to Kaʻaʻawa, shutting down access to the only major road through the area for several weeks (Richardson, 2020). Emergency measures taken by the State Department of Transportation typically include placing sandbags or constructing rock revetments. In addition to the road, the county beach park that was established in 1919 has a rock wall that was initially intended to level off a grassy field, and has subsequently become a seawall in most tidal conditions. There are several narrow "pocket beaches" where, for example, people sunbathe and fish.

3.3.3. *Kāhala*

Kāhala is situated on the south shore of Oʻahu along approximately 2.4 km of shoreline (Fig. 1c; Fig. 4). The neighborhood of Kāhala co-evolved with the creation and development of Waikīkī as Kāhala was seen as a proximate location that was still outside the bustle of the resort area (Honolulu Star-Bulletin, 1964). Today the sandy beach is a "low-tide beach," meaning that during high tide the water line comes up to the seawall and vegetation lines making access difficult for beachgoers. Approximately 40% of the beachfront is hardened with seawalls, many of which are consistently submerged (Amaya et al., 2021) and cause turbidity along the coastline. The walls were often initially erected with the motivation of creating more privacy for beachfront residents (Honolulu Star-Bulletin, 1935). The aim of privacy fuels an ongoing conflict where homeowners facilitate the growth of dense vegetation down to the waterline. The State of Hawaiʻi is charged with maintaining a public beach access corridor and enforcing restrictions on shoreline planting and vegetation growth to ensure public access (HRS § 115-5; Office of Conservation, 2021; University of Hawaiʻi Sea Grant College Program, 2018; Fujimori, 2017; Shikina, 2008). Kāhala has among the highest real estate values on the island of Oʻahu.

4. Results

4.1. *Currently important uses and values of beaches and coastlines*

Survey data demonstrate the broad perception that Sunset Beach, Kaʻaʻawa, and Kāhala are currently used and valued in multiple and

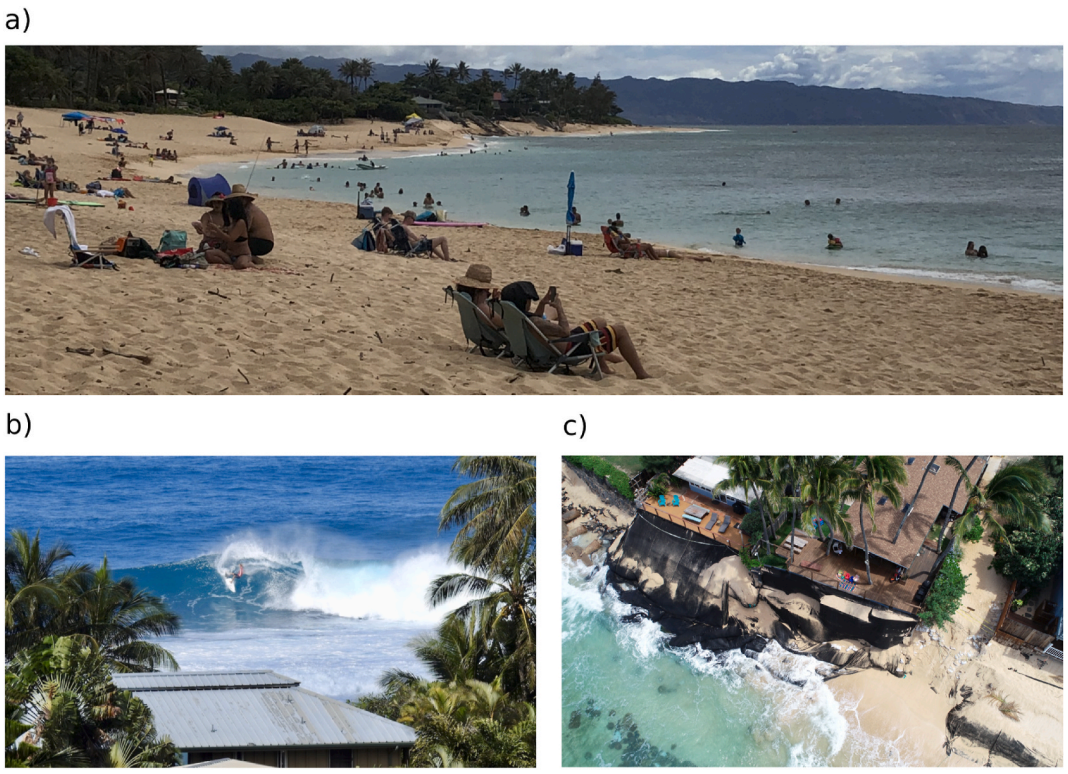

Fig. 2. Images of Sunset Beach showing (a) the beach during the calmer summer months which is popular for recreational swimming and sunbathing (photo credit: authors); (b) the world-renowned surf break with a surfer on a winter swell wave (photo credit: Aaron Ungerleider 2020); c) areas with extreme erosion where geotextile materials hold sand in place and protect homes. The beach when experiencing episodic beach loss is often difficult or impossible to traverse and creates discontinuity of the shoreline (photo credit: Dr. Shellie Habel - University of Hawai'i Sea Grant 2021).

Fig. 3. Images of Ka'a'awa showing: (a) pocket beach with a family swimming in the nearshore, adjacent to the coastal highway and its protective revetment; (b) beach park seawall where the sandy beach has disappeared; and (c) even without a sandy beach, the park is still a place where family and friends camp and gather (photo credits: authors).

Table 3
Study site socio-economic characteristics (American Community Survey (2019)).

	Sunset Beach	Kaʻaʻawa	Kāhala
Median Household Income	$98,000	$78,000	$156,000
Persons Below Poverty Level	5.0%	11.6%	7.0%
Median Value For Owner-Occupied Housing Unit	$1.0 million	$700,000	$1.9 million
Percent of population identifying as Native Hawaiian and other Pacific Islander	23.2%	53.4%	10.5%

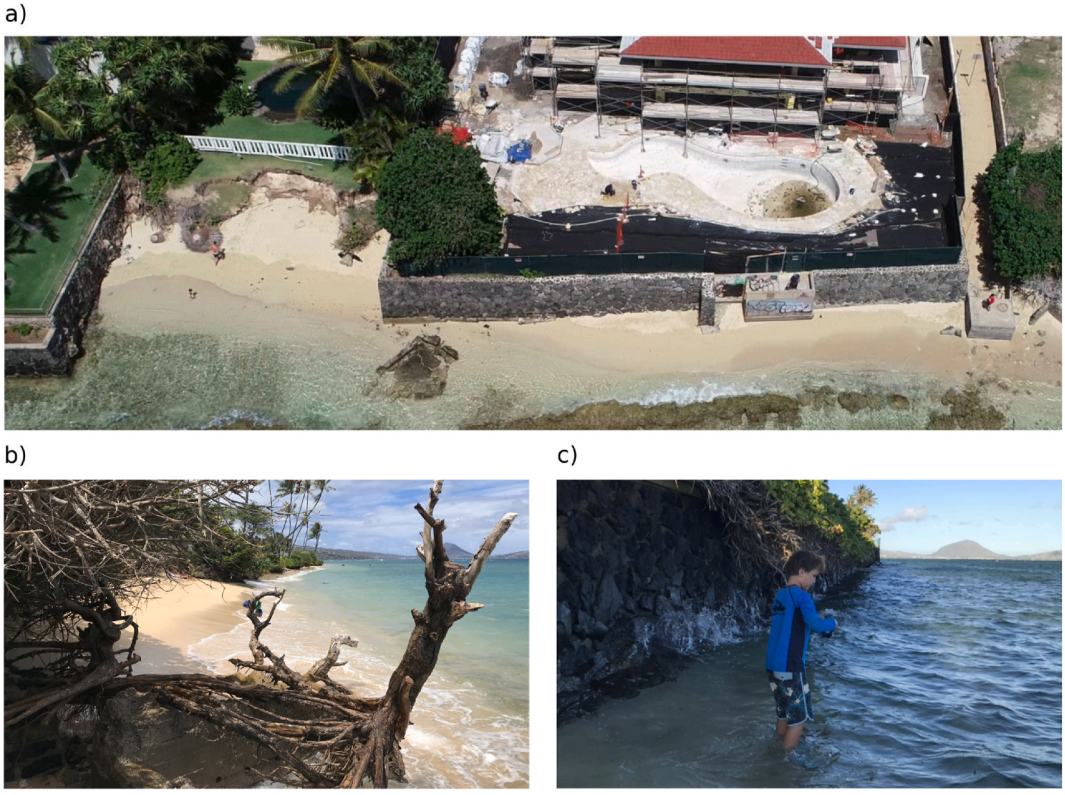

Fig. 4. Images of Kāhala beach showing: (a) a person on a pocket beach surrounded by seawalls on both sides (photo credit: Dr. Shellie Habel - University of Hawaiʻi Sea Grant 2021); (b) a thick vegetation line and a city stormwater outlet in disrepair with inundation, making it difficult to access the beach from the right-of-way (photo credit: Nori Tarui 2020); and (c) child walking out for a swim in an area where there is no longer a sandy beach, even during low tide (photo credit: authors, child of second author).

distinctly place-based ways, with subtle differences among government, private sector and civil society respondents (Fig. 5[4]). An interesting difference among groups is that private actors rated real estate, on average, lower than civil society and government actors. However, this difference is driven by two private sector respondents who rated real estate as "very low" and "low" importance across the three study areas. In contrast, ecological functions and habitat were rated more highly, on average, among private actors than civil society and government actors. There was relatively high variability among respondents within groups (reflected in the relatively large SD bars) in this category.[5] Further small differences among actor groups are discussed below within each study area.

Sunset Beach was ranked most highly in terms of average importance rankings across all uses and values (4.1; "high importance"). The highest mean responses were for nearshore and onshore recreation and aesthetic beauty, with almost all respondents rating these values as of "high" or "very high importance" (mean $>$ 4.5). A quote from a government interviewee captures this sentiment: "*The aesthetic value of the [North Shore] beaches, the beauty of the unimpeded horizon, the beauty of the drive and the mountains-that's why people go there to take their wedding pictures. That's why people go there just to enjoy the beach.*" Real estate, tourism, historical significance, ecological function and habitat, and spiritual and cultural significance were also considered, on average, of "very high importance" or "high importance" with private entities assigning slightly lower rankings than government and civil society.

Surfing was seen as both an important local recreational activity as well as part of the historical and cultural value of the coastline, as stated by a civil society interviewee: *"In my mind I was thinking of surfing as the heritage point … The North Shore is a significant place for how surfing has continued into the modern world. I think of that place as important to that heritage story of surfing."* A government interviewee noted the high spiritual and cultural character of this coastline, which they said is often not understood by the average beachgoer: *"From Waimea Valley, [it's]*

[4] Means +SD exceed max possible value in some cases due to the relatively small sample sizes and mildly skewed data. SD are used here to illustrate spread and should be interpreted with caution.

[5] The number of individuals responding the same across the three sites was highest for historical value (16 of 37 respondents responding the same across sites). The number of individuals responding the same across the three sites for the other values are as follows: spiritual value (9 of 37), ecological habitat (7 of 37), onshore recreation (6 of 37), onshore and nearshore subsistence (5 of 37), real estate and aesthetic value (4 of 37), nearshore recreation (3 of 37), and tourism (2 of 37). In short, participants were most inclined to give the same level of "importance" to all three study sites for historical values, and least inclined for tourism values.

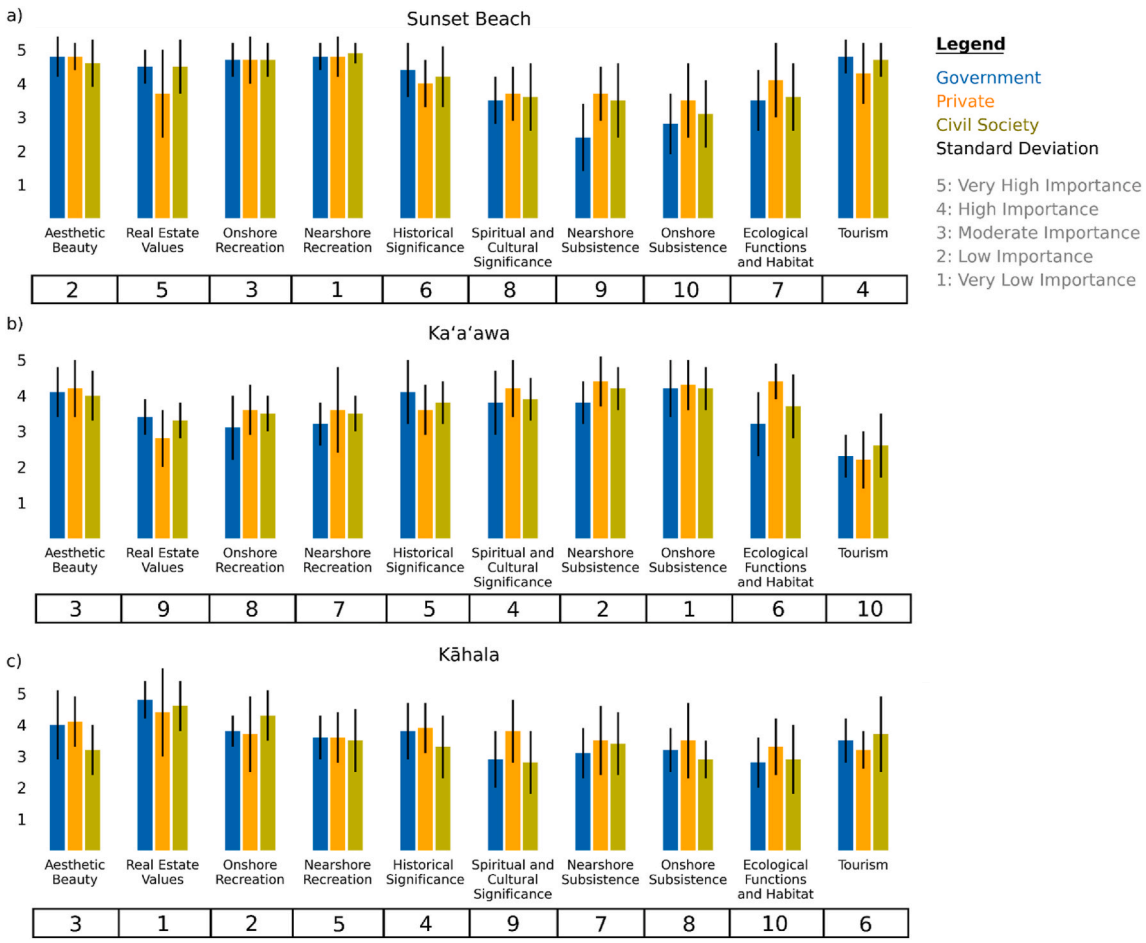

Fig. 5. Perceived current importance of uses and values in (a) Sunset Beach, (b) Kaʻaʻawa, and (c) Kāhala by government, private, and civil society interviewees. Uses and values are ordered by overall means (combining three sites and all participant groups) reading left to right (i.e. Aesthetic Beauty to Tourism). For each study site, the highest use/value (taken as an average of responses among participant groups) is denoted with a "1" on the x-axis, and the lowest with a "10."

very sacred going all the way down that coastline. A lot of mana [spiritual power] with the heiaus [places of worship] up above. There's a lot of cultural access and practices by beneficiaries that a lot of people aren't aware of." Interestingly, government agency participants considered nearshore subsistence in Sunset Beach as on average "low" to "moderate importance" (2.4), in contrast to private and civil society actors who considered nearshore subsistence as "high importance" (>3.5). Variation (as reflected in standard deviation bars; Fig. 5) was high in these categories with responses ranging from "very low" to "high importance" among government interviewees and from "low" to "very high importance" among private and civil society interviewees.

In *Kaʻaʻawa*, no uses and values were characterized by mean response values indicating "very high importance" by any stakeholder group. However, the majority of values (i.e. spiritual and cultural significance, historical significance, aesthetic beauty, nearshore subsistence, and onshore subsistence) were considered to be of "high importance," with responses ranging from considering these values as of "moderate" to "very high importance." Kaʻaʻawa notably had the highest rankings of nearshore and onshore subsistence of the three study areas, reflecting the long-standing connections of the local community to this shoreline. A government interviewee explained: *"Kaʻaʻawa is definitely where you see a lot of the bulk of the shoreline fishing for sure. A lot of diving along that side, too. Limu [marine algae] gathering over there. There's lots of heʻe [octopus] … That's definitely one of the biggest uses from our cultural perspective."* Tourism, in contrast, was rated as "low" to "moderate importance" (2.4) in Kaʻaʻawa, with just one high rating, a "very high importance" by a civil society respondent.

Finally, in *Kāhala*, real estate was the only value considered of "very high importance," (>4.5), with all three groups rating this value as most important in the study area. Onshore recreation was also considered of "high importance," particularly by civil society entities (4.3). While aesthetic beauty and historical significance were considered "important" by government and private entities, they were considered only of "moderate importance" to civil society actors. All other values were generally rated, on average, as of "moderate importance," but individual responses varied. While Kāhala is marked by high real estate values, many interviewees emphasized the continued connection to this coastline by a wide range of communities despite coastal build out and in ways related to historical, cultural, spiritual and subsistence values. In the words of one government interviewee: *"It [Kāhala] is a place for people to go to understand that our kūpuna [ancestors] are all over the place and connect with the ocean and our kūpuna."* Similarly, a civil society interviewee commented on the historical significance of Kāhala, which they argue would have different meanings for different coastal actors: *"Somewhere in that [Kāhala] area, I believe is where Kamehameha [Hawaiian royalty who unified the islands] made his landing on Oʻahu. That seems like a big deal. You know, to me, and I would imagine to some other people. But I don't know if people at the Kāhala Mandarin [hotel] or people who are on the golf course would feel the same."* At the same time, a private sector interviewee suggested that Kāhala also has historical value based on the more recent development history: *"Kāhala has its development history, and a few of those properties have a long history of interesting developments and people have lived there. Those properties themselves have some historical significance."*

4.2. Ideal uses and values for decision-making around SLR adaptation

In terms of perceptions of which uses and values should ideally be prioritized in decision-making around SLR moving forward, responses were similar to what was considered currently important, with several notable exceptions (Fig. 6; Fig. 7). In contrast to values seen as currently important, ecological function and habitat, followed by spiritual and cultural value were given the highest overall scores across study sites and groups. On the other hand, though rated as the top or within the top five currently important values in Kāhala and Sunset Beach respectively, respondents, on average, thought real estate should be given the lowest priority when making decisions about SLR in all sites. However, there was variability in responses, particularly among government and private entity respondents. For Kāhala, two government and two private entity respondents considered real estate of "very high importance" in ideal decision-making, and in Sunset Beach two private entities, but no government agencies gave real estate this very high priority. Aesthetic beauty and tourism values were also down ranked across all three sites, though aesthetic beauty continued to be in the top four for Sunset Beach.

The high prioritization of ecological function and habitat relates to the inherent ecological values of beaches as expressed by a civil society interviewee: *"The interface of the coastline and the ocean is such a waiwai [rich, abundant] place. It's not in all places, but along coastlines where freshwater meets the ocean … it's a protective, delicious, safe area for baby things to grow-whether they grow up to be only nearshore species or deep species,"* as well as to the recognition of the links between ecological function and habitat and other values, including tourism, recreation, and subsistence. For example, a private sector interviewee pointed to the critical link between healthy ecology and tourism: *"If our 'āina [land] isn't thriving, we're not going to thrive as a community and as people. If we're not doing those two things first, we're not an appealing visitor destination."* Similarly, the importance of the natural habitat of beaches to recreation was noted by a civil society representative: *"I think that [recreation] is a primary value from the human perspective-it's just our ability to be with nature, connect with nature."* Likewise, the connection between ecological function and habitat and subsistence values was expressed by interviewees, including another private sector interviewee:

> "*We have to understand, and again this is partly how I was raised, that our oceans are a refrigerator first. And our ability to access them and to feed and sustain ourselves is right up there. And tied to that obviously is the ecology, the nature, making sure that we pay attention to the entire watershed.*"

For Sunset Beach, rankings of real estate and tourism dropped from "very high importance" in the current classification to "low importance" and from "moderate" to "high importance," respectively (Fig. 6a). Interviewees considered ecological functions and habitat and nearshore recreation, followed by spiritual and cultural significance, the most important uses and values to consider in decision-making around SLR. Such prioritization was reflected in the interviews with many sharing the importance of Sunset Beach as an iconic beach critical to preserve (via restricting seawalls). From a legal perspective, one interviewee

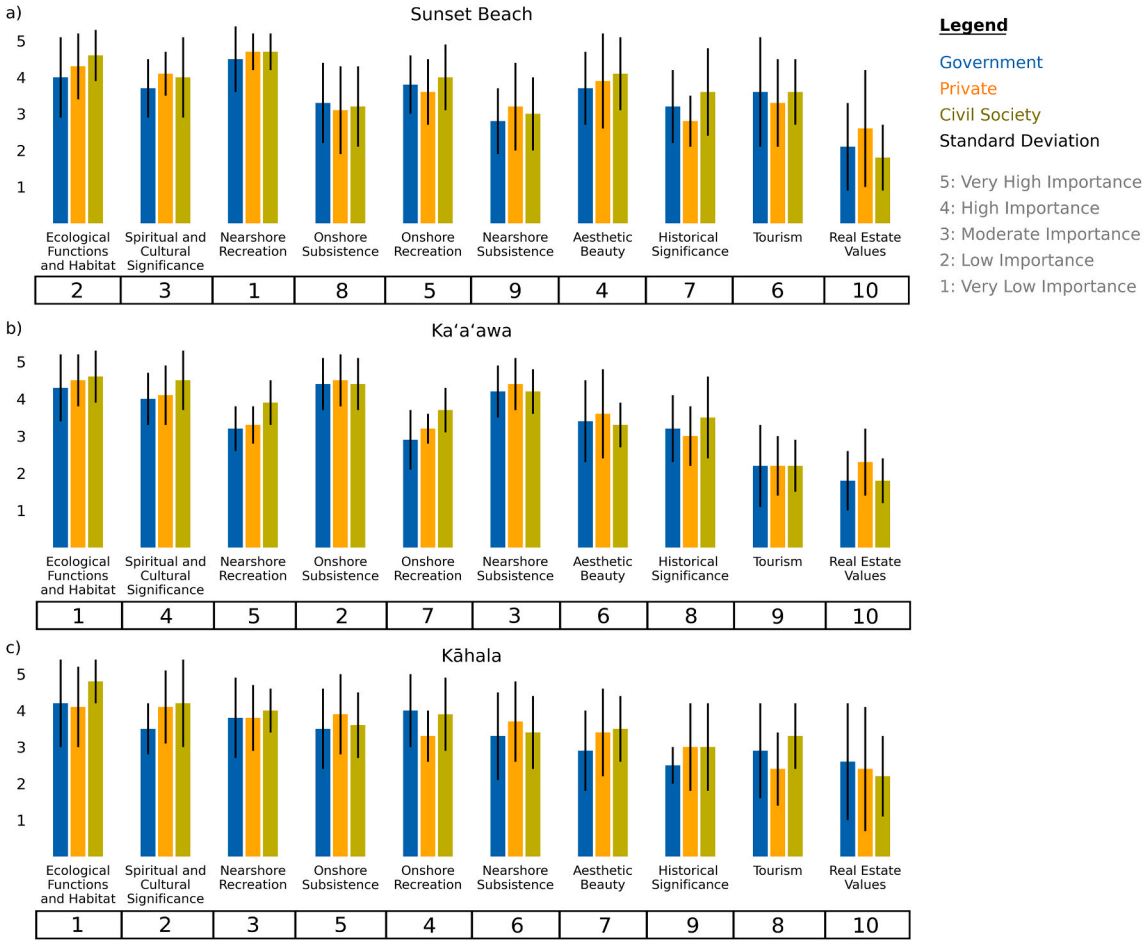

Fig. 6. Perceived ideal prioritization of uses and values for shaping decision-making around sea level rise in (a) Sunset Beach (b) Ka'a'awa (c) Kāhala by government, private, and civil society interviewees. Uses and values are ordered by overall means (combining three sites and all participant groups) reading left to right (i.e. Ecological Functions and Habitat to Real Estate Values). For each study site, the highest use/value, taken as an average of responses among participant groups) is denoted with a "1" on the horizontal axis, and the lowest with a "10."

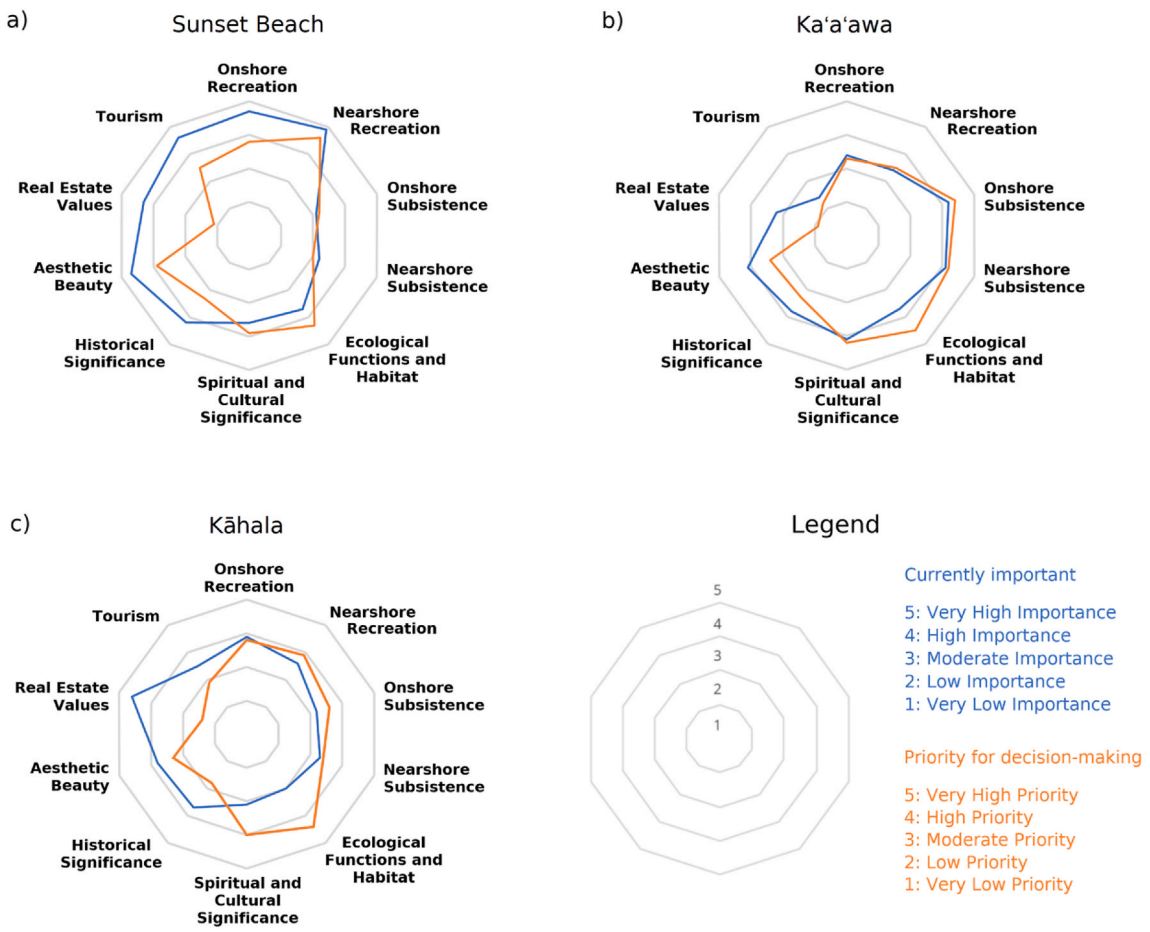

Fig. 7. Perceptions of what is currently considered important (blue) versus what interviewees perceive should be ideally prioritized in decision-making (orange) in (a) Sunset Beach, (b) Ka'a'awa, and (c) Kāhala. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

explained how SLR results in private land becoming public land in the context of Hawai'i's 40-foot-minimum shoreline setback law. Any stopping of this process through erecting sea walls, was in this participant's view, "*basically stealing public land.*" There was recognition that, while real estate is important in the area, there is necessarily a tradeoff between protecting this important beach and maintaining private property through further coastal hardening. The slightly higher prioritization of real estate by private sector entities, on average, in comparison to government and civil society, may reflect the inherent tension that this brings.

In Ka'a'awa, onshore and nearshore subsistence and spiritual and cultural significance were seen as nearly as high of a priority as ecological functions and habitat, likely in reflection of high community reliance on and connection to the marine environment. In the words of a civil society interviewee:

> "*I don't use that word [subsistence] lightly, because it can be extremely trivialized. But subsistence of our nearshore environment is extremely important. And so that would be a value that I would both personally and professionally prioritize because it speaks to ecosystem health and it speaks to human health … Obviously, it's of extremely high importance in Hawaiian culture, and the way that resources are managed ….And I think that's a real value of beaches.*"

Like the other sites, interviewees ranked real estate values as the lowest priority. Many interviewees expressed sadness over what has already been lost in terms of access to the marine environment through beaches that have largely eroded due to roads and beach parks. In the words of one government interviewee: "*People don't want to sit in their car … Because the beaches are gone, there's less of that type of camping and staying overnight and doing all those different kind of [Native Hawaiian cultural] practices.*" However, others noted the continued use of the coastline for nearshore subsistence activities, which rely less on the beach. In designing adaptation responses, multiple interviewees suggested the importance of thinking about how to maintain these subsistence and cultural values through, for example, ensuring that any shoreline structures were amenable to fishing and other coastal activities and ensuring that measures are taken to improve coastal water quality. A government representative, for example, emphasized the importance of thinking about cultural and recreational values even when designing engineered solutions: *"So if we have to harden something to protect the shoreline, is it possible to at least shift a little bit to allow for fisherman to recreate instead of being like five, you know, two feet away from the traffic lane?"*

Finally, in Kāhala, ecological functions and habitat was the highest priority overall, followed by spiritual and cultural significance and nearshore recreation (Fig. 6). This ranking is somewhat similar to Sunset Beach. Though Kāhala was not elevated to the extent of Sunset Beach as an iconic beach critical to maintain, interviewees emphasized the ecological, spiritual, and recreational values for local residents. In the past decades, the ways in which Kāhala beach was used and valued by the community appears to have changed as the area became increasingly developed. According to a civil society representative, Kāhala *"used to be a rich fishery,"* where they would *"dive there a lot, but [now there are] too many tourists and less fish over the years.*" Many expressed a sense of injustice at the beach loss already experienced as a result of shoreline hardening and prioritization of private property over public access.

Maintaining access to this shoreline even as the beach becomes narrower is seen as critical and rife with future conflicts as explained by a government representative: *"There are wealthy property owners and people are quick to challenge you on beach access. People don't want to deal with that, so as the beach narrows less people will go there. It gets more and more contentious."* Several interviewees discussed the limited capacity (including human and financial resources) of government entities to deal with lawsuits and threats over "takings," even if existing CZM laws support government actions. This fear of litigation is one explanation of why real estate values continue to take priority in decision-making.

In addition to *what* values, interviews also illuminated the importance of *whose* values should be included in decision-making around SLR response. There was general agreement that the main community of people who should have a say in coastal decision-making, including SLR response, starts with residents and those with strong ties to the area. Typically, most participants conceptualized community as those who live in an area, who use the resources in an area, and those who perpetuate the culture of that area. This definition then can extend to anyone who interacts with that space, such as the general island community, especially when thinking about transportation and infrastructure use. In general, interviewees viewed tourists as a stakeholder in that "*healthy beaches promote tourism*," but also felt that: *"Tourism should not be driving decisions that we make regarding the protection of our natural resources. It's just a utilitarian thing. It's a business that we need, in order for us to enjoy the kind of life that we enjoy."*

There was a strong sense by many interviewees that Native Hawaiian families with ancestral knowledge connections to place need to be more deeply included in decision-making. In the words of a non-profit conservation organization representative: "*Those who live there, those who have ties there, those who go back generations there hold the strongest voice."* Relatedly, a civil society representative emphasized the importance of elevating those with *kuleana* (responsibilities and rights) to beaches in decision-making: "*We want to start with whoever it is that has ownership – not private property, but kuleana to protect it.*" In distinguishing between private land ownership and ownership in the sense of long-standing connections and rights to a place, this interviewee emphasized the importance of ensuring that actual connection and relation to place (not just private land ownership) entitles voice in decision-making. Likewise, another interviewee emphasized the knowledge inherent in generational connections to place: "*We need to have a sense of place – Western wisdom is not always the answer. There needs to be cultural consideration and we need to give perspective to people who have been here and walked the area."*

The discussions of *whose* values also differed by place, largely based on the influences of tourism and property values as well as the ongoing connection of local communities to place. In Kaʻaʻawa there was much more focus on residents and those with long-standing connections to place given the economic and historical context. In contrast, given the contexts of property values, tourism, and island-wide recreation at Kāhala and Sunset Beach, the community was generally defined more broadly. In the words of a representative from a planning organization:

> "*I think the element of tourism and recreational resources definitely changes how big the scope is. I think Kaʻaʻawa is maybe the best example of a community that is a little more refined, where you don't have as many … tourists going up there to use that space … So I would say there it's pretty focused on being a more local community. But with Sunset Beach, [the community] gets a bit wider, where people all over the island and from abroad go to Sunset Beach because it has the best surfing in the world*"

4.3. Emerging and exacerbated conflicts between uses and values in the face of SLR

A striking result from the survey and interviews demonstrates that interviewees generally perceived ecological, aesthetic, and spiritual and cultural values to be of "high importance" across all three of study sites. In follow-up interviews, many expressed that beaches are Hawaiʻi's "*gathering place*," though this function is literally eroding as the beaches are themselves. In the words of a government interviewee:

> *"That whole experience of bonding, the family, the fresh air- that's so critical. And we've lost a lot of that. As we lose the beaches, we lose that part of our culture, which is Hawai'i's culture. Whether it's a barbecue and have a picnic and spend the whole day at the beach … That's a beautiful healing bonding thing for families and communities. We're losing that because the beaches are disappearing.*"

Moreover, though interviews revealed broad consensus that the protection of and access to beaches is critically important in the face of SLR, with people often citing beaches as part of the public trust, there was discrepancy in how interviewees envisioned tradeoffs between protecting beaches versus private property. Many stated that "*hard choices*" between the beach or its adjacent land will have to be made across Hawai'i in the face of SLR. In the words of a government interviewee:

> "*It's [Sunset Beach] an iconic, irreplaceable resource that's faced with the challenge of having way too overvalued property sitting atop of it. That needs to be removed in order for that beach to survive. There's no other way.*"

As another government participant put it even more bluntly, *"I could care less if somebody's property values go up or down based on either sea level rise or a public action taken in the public interest."*

On the other hand, interviewees that felt more strongly about private property rights tended to advocate for a more "balanced" approach to assessing the tradeoffs inherently involved in SLR response. This is captured in a quote from a private sector interviewee:

> "*We definitely believe in private property rights and that aspect in many different things, with shoreline, sea level rise, short term rentals, property taxes, all different types of things there has to be a balance … When someone purchases a property, they should be able to do with that property what they want. That is their right, owning that property. We advocate for private property rights and want everybody to be able to do with their property as they need. But then when you're doing things to the property, such as seawalls, that will impact the beach and your environment that impacts your neighbors, that becomes a difficult issue …*"

Similarly, a subset of interviewees from all three sectors also held optimistic notions that somehow both beaches and private properties could both be maintained in the face of SLR:

> "*If we can stop it [the sea] before it gets too close, that's where we want to be … We would be advocating for items other than [seawalls], that are more ecologically friendly and able to assist with the property and keeping it secure from losing its shoreline.*"

Yet others indicated a need to see private property claims and residential interests as themselves differentiated, highlighting the stakes of losing access to private residences along the coastline for many inhabitants and the deep connections to place these actors also often held. As one civil society interviewee articulated:

> "*We tend to think that every property owner is a wealthy investor from somewhere else. That's not always the case. I think we need to be sensitive to the attachment that people have to some of these places and these properties. The investment that they put in, the impact of losing that investment - it's going to impact some people a lot more than others. It's a really difficult situation.*"

Several participants emphasized the role of Hawaiʻi's new real estate disclosure law to change homeowner expectations of their ability to protect their property in the face of SLR. A private sector interviewee

noted:

> "*The ocean gives and the ocean takes. Whether the house is there is up to nature. [In my profession], I would also say the same thing to people … I say it might be here today and might be gone tomorrow. Especially now with the restrictions on walls. In terms of what we've learned about? How it affects the ocean currents and sand.*"

In addition, interviews revealed that many actors believe SLR will exacerbate existing conflicts around beach access. As beaches are lost, interviewees noted that onshore recreational activities are becoming increasingly concentrated in areas that remain, creating "*extremely packed*" conditions. When losing lateral (horizontal) beach access under SLR, one government interviewee noted:

> "*You're basically creating private shoreline that no one else can access … It's not about me, mine, it's about ours, and preserving way of life. And so, you know, to me, shoreline access is extremely important.*"

Ecological uses and values were seen as facing significant challenges as sea levels rise. Interviewees emphasized that SLR would result in the loss of critical beach habitat for native and endangered plants, birds, and animals, as well as a change in the nearshore environment such that there would be losses to estuary ecosystems. In the words of one civil society representative:

> "*Areas that would be productive because they're brackish water areas-they won't be brackish water areas anymore. That change in nearshore water makeup or chemistry is definitely going to affect the fishpond [Indigenous aquaculture] guys.*"

Other subsistence uses, however, were noted to possibly be preserved in the face of SLR. A civil society representative explained, *"For a he'e (octopus) fisherman, it doesn't matter whether a sandy beach is 10 to 15 to two feet wide."* In addition, proactive design was seen as potentially helping to mitigate some of the tradeoffs between specific uses in SLR response. Multiple interviewees discussed the idea of creating areas along the coastal road in Kaʻaʻawa so that fishermen could still comfortably access the nearshore water. The impact to other activities, including nearshore recreation like surfing, were considered largely unknown and in need of further place-specific research related to the movement of the sand, or turbidity caused by hardened structures.

Lastly, several interviewees discussed the tradeoffs posed by SLR in preserving coastal cultural sites. A civil society representative explained:

> "*You can't save the historical resources at the same time as saving the beach resource … And another thing to think about is archeological finds. There are a lot of dune systems, which is where iwi kūpuna (ancestral bones) is buried … There is a section of the community that's more interested in preserving that iwi versus preserving the beach. But basically, there is no way to save all of it. You just kind of have to weigh which ones are more important.*"

One governmental interviewee expressed with reference to prioritizing cultural values in making SLR and beach management decisions that "*a beach can become more important than it is today by people learning more about it and choosing to protect it and spend time there*." This individual argued, for instance, that cultural uses and values along the Kaʻaʻawa coastline would become even more important through such management approaches:

> "*As more people are becoming aware of the burial issues over there [Kaʻaʻawa], there'll be a reconnection to that area by the Hawaiian community. They'll start putting importance in Kaʻaʻawa because the attention to it will bring out moʻolelo and legends and family histories and people start connecting the dots.*"

5. Discussion and conclusion

SLR, and subsequent value-laden adaptation responses, increasingly alters the character, function, and terms of access to beaches and coastlines (Mach and Siders, 2021; Tavares et al., 2020). SLR responses, whether through adaptation-in-place, retreat, or something in-between, all have implications for the way that people use, relate to, and value coastal areas (Bordner et al., 2020; Dedekorkut-Howes et al., 2020; Mach and Siders, 2021). Improved understanding of how decisions about SLR response actions prioritize the uses and values of coastal areas is important to informing the development of coastal governance processes in the face of rapid environmental change. Accordingly, this study provides a case study centered on three distinct coastal areas on Oʻahu and explored the suite of uses and values that government, private, and civil society actors involved with coastal management and decision-making perceive to be currently important and what should be ideally prioritized to guide future management decisions in the face of accelerating SLR.

An important finding from this work is the broad recognition by nearly all interviewees that the social and ecological values of beaches are critical to maintain. However, similar to Abel et al. (2011), we find that current coastal decision-making prioritizes private development. Given this, the majority of participants said that real estate values should ideally be de-emphasized in decision-making for SLR response. Interviewees pointed to the deep relationships many communities have with beaches and coastlines, and the way that these places underpin Hawaiʻi's culture and way of life. These relational values (Chan et al., 2016; Gould et al., 2020) are among the most important aspects of beaches, particularly for people with intergenerational relationships to coastlines. Beaches in Hawaiʻi are central to diverse ways of life from recreation, to subsistence harvesting, and to social connections and spirituality. While tenuous to quantify and easily incorporate into cost-benefit analyses, these relational values speak to what diverse actors engaged in coastal management across Hawaiʻi believe merits protection.

That all three groups of interviewees perceived the relative importance of diverse uses and values to vary substantially by location is perhaps unsurprising, but nonetheless serves to inform policy. Current CZM approaches in Hawaiʻi have limited criteria for differentiating place-based interventions (i.e. the presence of a sandy beach and public infrastructure, HRS § 205 and ROH § 23), which limits considerations of SLR response strategies that might be appropriate to enhancing shared priorities in one area of the island but detrimental to another. For example, a seawall that provides access to nearshore fishing resources might perpetuate this important activity in some areas while a similar seawall might be ruinous to beach ecosystems and associated social values in another area. A potentially promising approach to a more nuanced, placed-based means of approaching SLR planning is presented in the concept of Operational Landscape Units (OLUs) within the San Francisco Bay Shoreline Adaptation Atlas (SFEI and SPUR, 2019). The Atlas's OLUs identify geographical areas that share physical characteristics and places to "work with nature to identify where natural and nature-based approaches can be used to create a resilient shoreline with multiple benefits" (p. 13). While comprehensive policy frameworks are certainly needed, a more place-based, multi-objective approach would better tailor SLR response strategies to limit maladaptation.

SLR and default responses to SLR challenges to date within the study sites were generally seen to exacerbate conflicts between public and private values. Interviewees strongly agreed that the use of beaches as part of the public trust needs to be prioritized over private interests, reinforcing existing Hawaiʻi beach management laws yet implicating a challenging shift in implementation and enforcement. However, interviewees also had varying perceptions of the tradeoffs inherent in SLR and SLR response. Some placed emphasis on innovations that would make the tradeoffs between protecting private property holdings and maintaining sandy beaches less stark, and others disagreed that tradeoffs

could in fact be mitigated. While engineering innovations that preserve sandy beaches and private properties in the face of substantial SLR are not likely (Vitousek et al., 2017a, 2017b; Anderson et al., 2020), there is some validity in the hope of lessening tradeoffs, particularly if calls among climate scientists for rapid decarbonization over the next decade are realized and mean increases in sea levels are slowed by end of century (IPCC, 2021). Emerging concepts for "living with water" and nature-based approaches to adaptation-in-place may also support multiple uses and values (Arkema et al., 2017; Narayan et al., 2016; Spalding et al., 2014), at least in the near-term.

Nonetheless, existing data suggest that approaches that simultaneously protect both private property claims and sandy beaches remain elusive despite growing attention to coastal adaptation amid rapid SLR (Abel et al., 2011, Dedekorkut-Howes et al., 2020).[6] This root conflict between public and private values in the face of SLR help to explain Hawai'i's duality as a state that is both at the forefront of public beach management and climate change adaptation from a policy perspective, yet one that also continues to lag behind in the concrete implementation of SLR responses amid ongoing coastal hardening and beach loss (Cocke 2020a, 2020b, 2021; Summers et al., 2018; Tavares et al., 2020). Moving forward with government responses to SLR will require navigating these conflicts, including with fuller understandings of how coastal communities themselves value and prioritize beaches and coastlines and envision adequate and just responses to the challenges they are facing (Mach and Siders, 2021).

To bridge this gap, not only among institutional actors but also between decision-makers and communities, there was general agreement that there needs to be much more done to involve communities in decision-making around SLR to ensure that diverse uses and values are considered in SLR adaptation actions. In particular, interviewees emphasized the importance of consulting with those with long-standing generational connections to these places, including through deeper engagements with Native Hawaiian viewpoints and knowledge, as well as a broader set of people with connections to place. Participants expressed the need to overcome important financial, capacity and structural challenges to see through implementation of policy priorities. A more cohesive island-wide planning framework that is substantially resourced for adequate community engagement and collaboration between multiple state and county agencies responsible for activities within the coastal zone could more effectively provide pathways for protecting critical ecological and socio-cultural values.

This study focused specifically on government, private, and civil society actors engaged with coastal decision-making on Oʻahu. While many of our interviewees were intimately familiar with and, in some cases, part of the local community of particular coastlines, a critical next step in this work is engagement with local communities (and other stakeholders) connected with these and other coastlines to more deeply understand their relationships to these places. With a comprehensive understanding of the suite of uses and values that characterize various beaches, institutional actors, local communities, and other stakeholders may more usefully be able to discuss and deliberate on SLR response actions that are most effective and equitable. These decisions will inevitably be difficult and require tradeoffs, but making these tradeoffs explicit and understanding what really matters to people most affected by these decisions is critical for the future of Hawai'i and coastal areas around the world.

[6] Some work suggests that even where both sandy beaches and property claims are upheld (as in the case of hardened seawalls and nourished or artificial beaches), such outcomes may ultimately reflect an unjust and 'color-blind' approach to SLR adaptation that ignores the historical exclusions shaping private property claims (Hardy et al. 2017).

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