Real-time monitoring of coastal community values

First season project report

Prepared by:
Dr Carmen Elrick-Barr, UWA
Dr Julian Clifton, UWA
Dr Michael Cuttler, UWA
Craig Perry, PNP
Dr Abbie Rogers, UWA

THE UNIVERSITY OF WESTERN AUSTRALIA

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Introduction

This report presents the results of the *Real-time Monitoring of Coastal Community Values* project, funded by the West Australian Planning Commission (WAPC) through the Coastwest grants program and the Peron Naturaliste Partnership (PNP). It presents the results of the pilot project during its first seven months of operation and discusses the benefits and limitations of this novel coastal monitoring program.

Context

The coast is an integral part of the Australian identity. We live by, play on, and connect to the coast. We benefit from it culturally, socially, economically, and environmentally. Yet these values are at risk from global climate change and coastal development. Over the last decade, management efforts have sought to better understand these impacts and response options, primarily through risk assessment and adaptation planning to address the impacts of climate change. These efforts have been supported by Federal and State governments and in recent times have placed increasing emphasis on understanding the community values attached to the coast. This transition recognises that regardless of mitigation efforts, coastal areas are committed to a degree of sea-level rise that will continue for centuries to millennia (IPCC 2021). Furthermore, population growth will continue with associated impacts in coastal areas. By understanding the values people place on the coast and its use, managers can deliver outcomes that preserve these values, where possible.

Values are complex, diverse, and dynamic. The benefits one person derives from the coast will differ to that of their neighbour and change over time as their experiences and the physical environment change. As such, understanding values requires extensive consultation, collaboration, and engagement. To date, our understanding of coastal values has been gained via consultation or surveys of coastal stakeholders (residents, visitors, business owners) at different stages of the risk assessment and adaptation planning process. West Australian local governments, for example, are utilising community surveys and workshops, which generally require significant resources (human and financial), specialist expertise and knowledge, and are reliant upon community members being available and willing to participate at a specific time and place. While these mechanisms provide a valuable means to understand a segment of the communities' views at one point in time, the resource investments required mean they are generally only conducted on an as-needs basis, and often do not provide consistent (e.g., questions, facilitators, and participants) and/or long-term (temporal) information.

Therefore, to complement and extend information on coastal community values for use in coastal management and planning, this project sought to develop an innovative approach to gather information on coastal community values. It is the first remote, real-time monitoring of coastal community values globally (as far as the project team is aware) and will provide valuable insights into the capability of this data collection technique for filling a gap in knowledge regarding our connection to the coast, what is valued and how these change over time.

Project Aim

Collect real-time data on coastal community values in the Peron Naturaliste region in a participatory and cost-efficient manner.

Project Objectives

Long-term monitoring is critical to effective coastal planning and management. Yet long-term data on coastal social values is not available to decision-makers. Its development would complement existing data, such as one-off social values surveys and workshops, and medium and long-term physical coastal data, currently applied in coastal planning and management. In implementing this project, we sought to test a novel and innovative approach to social values data collection.

The objectives of the project were to:

- Engage and involve the community in the collection of information regarding the coast and its value to them.
- Develop a long-term social values dataset that will assist in the protection and management of the coast.
- Address an identified gap in the PNP Regional Coastal Monitoring Program in relation to community monitoring.
- Contribute to a sustainable and comprehensive regional monitoring program.

Approach

Citizen science and leveraging existing infrastructure

Citizen science is part of a growing global movement to engage the community in scientific research. In this project, an established citizen science program, CoastSnap, was adopted as a tool to support the collection of real-time community social values of the West Australian coast. CoastSnap provides the opportunity for the community to contribute to beach monitoring by inviting them to take and submit photos of the beach. Over time, CoastSnap records erosion and recovery cycles, and long-term changes, helping researchers to understand why some beaches are more dynamic or resilient than others.

In early 2020, the PNP in collaboration with researchers at the University of Western Australia (UWA) and with support from WA Department of Transport, installed nine CoastSnap fixed platform sites along the Peron Naturaliste coastline (Figure 1). This infrastructure provided an opportunity to collect data on community coastal values in a long-term, consistent and resource efficient manner.

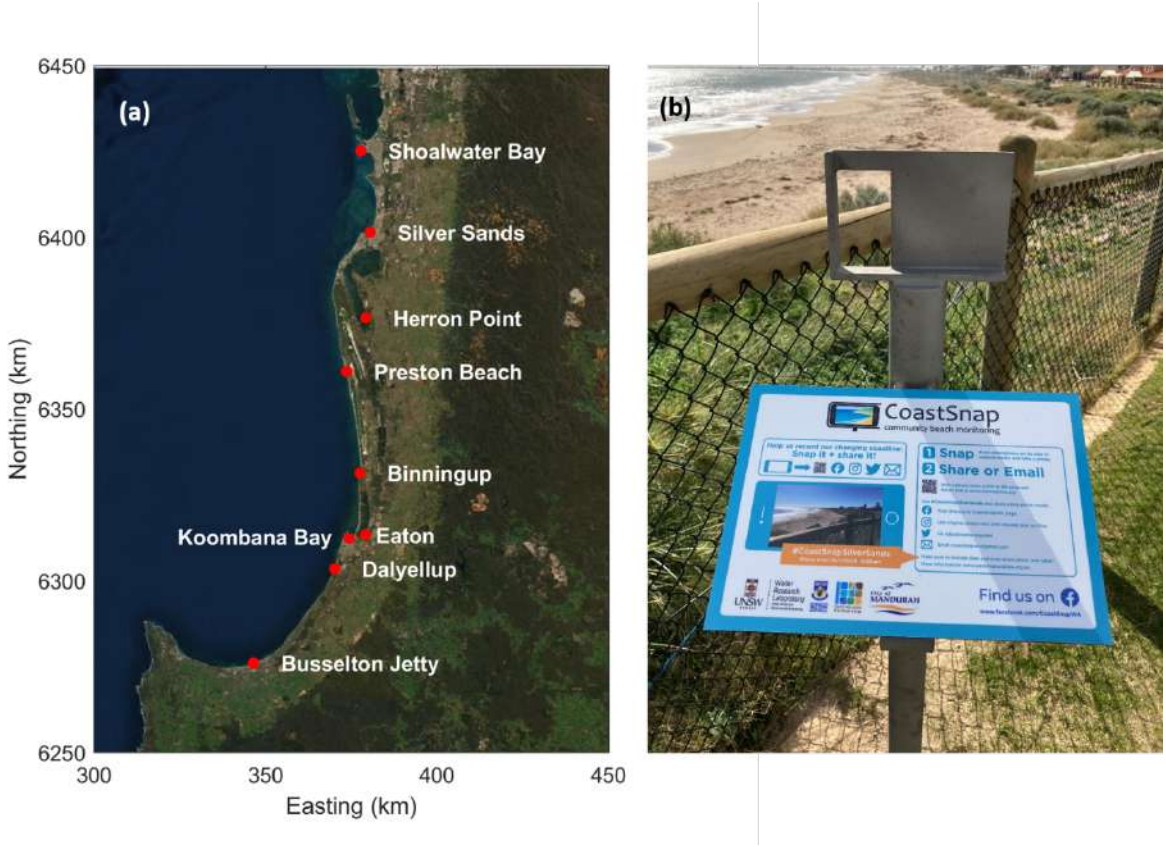

Figure 1. (a) Overview of CoastSnapWA sites within the PNP region. (b) Example CoastSnapWA smartphone cradle and signage from Silver Sands (Mandurah, WA) (Source: Cuttler and Hansen 2022)

CoastSnap is a global initiative, with over 4,000 CoastSnap sites worldwide, including in the USA, Canada, South Africa, Europe, and Australasia, among others. While it has been recognised that CoastSnap provides an opportunity to collect social information in addition to physical beach

change (*pers comm. Mitchel Harley November 2021*), this is the first project that seeks to apply and test the capability of this technique to perform this function.

Survey design

The survey was designed and developed by academics with expertise in the assessment of social values and local government practitioners. UWA Project team members designed the survey, with reference to international literature and coastal social surveys applied in Western Australia, for example, through the Coastal Hazard, Risk Management and Adaptation Planning (CHRMAP) process. The survey differs from traditional one-off social values surveys in its objective to capture data that monitors change in community values and perceptions over time, and link information on use and values to physical coastal condition.

The survey was separated into two components to reduce the time commitment required of survey respondents, whilst providing an opportunity to gather additional information. The response time for each component was approximately 5 minutes.

Users complete the survey while at the beach and therefore, it was important to ensure it was quick and engaging. The first component collected information on emotions, use, values, and perceptions; while the second component collected additional information on visitation, perceptions of change, and the economic value of the beach (refer to Table 1 for further information).

Table 1: Survey structure and content, for the Real-time monitoring of coastal community values

Survey Component	Content and rationale
Component One: Part A	Captured information on respondents' emotions. It is argued that the coast plays an important role in the emotional well-being of Australians, but there is limited empirical evidence measuring this relationship. The objective was to understand users' emotional reaction and to measure emotional engagement with the beach. The use of emojis to gather such information has been applied in consumer research, but not in an environmental management context. By including a question on the emotions users feel when visiting the beach, we intended to understand how emotional attachment differs based on beach condition and how it is linked to use and values. The use of emojis is also held to increase engagement and youth participation. In selecting emotions, we drew on the widely accepted theory of basic emotions and their expressions, developed by Paul Ekman, which suggests there are six basic emotions, which include sadness, happiness, fear, anger, surprise, and disgust.
Component One: Part B	Explored motivation to visit, with the objective of obtaining information on beach activities, uses and their importance. Comparing use and importance across the PNP region may aid in planning nodes of activity; while exploring the relationship between use, importance and

	beach conditions can direct efforts to achieve improved condition (e.g., safety, amenity) based on the uses and values sought to be maintained or developed.
Component One: Part C	Gathered information on perceptions of beach conditions, to explore the link between beach condition and emotional engagement (Part A) and use (Part B). For instance, the survey sought to explore (i) the emotional attachment of visitors to the beach and how this compares across sites; (ii) how attributes of the coast, its visual condition and/or the activities possible, influence emotions.
Component One: Part D	Gathered information on the ability of the respondent to conduct the activities they sought, and the influence of beach condition. By understanding the link between beach condition and use, coast managers can plan for nodes of use based on projected changes in beach condition (e.g., because of natural change and/or human interventions).
Component One: Part E	Gathered information on respondents' perceptions of coastal change and drivers of change. It highlights whether perceptions of change are consistent or variable across users and regions, which in turn can provide insight into communication needs.
Component One: Part F	Collected basic information on respondent characteristics.
Component Two: Part A	Gathered additional information on perceptions of beach change, if they had previously visited the beach, and concern for and awareness of the impacts of climate change on the beach.
Component Two: Part B	Gathered the information required to perform an economic assessment of the value of the beach, using the Travel Cost method. The pros and cons of different economic valuation approaches were considered by the Project team and local government practitioners (see Annex 1). The Travel Cost method was selected for its simplicity, noting that it would only provide an indication of current recreational use and value.

A draft survey was compiled and presented to Local Government practitioners at a workshop held on the 19 November 2021 at the City of Bunbury. During the workshop, the rationale for each element of the survey was discussed with participants, who provided feedback to ensure relevance to local context and decision-making needs. A copy of the presentation and the information delivered to participants prior to the workshop is presented in Elrick-Barr et al. (2022). In addition, local government practitioners who were unable to attend the workshop provided feedback via email.

Following design, the survey underwent ethics approval at the University of Western Australia (HREC number 2021/ET001035) and was uploaded to Qualtrics, an online survey system. The link

to the survey was then attached to the CoastSnap system. When people visited a CoastSnap site were invited to take and submit a photo, as per the CoastSnap program objectives. Upon submitting their photo, they were provided with the option to complete a short survey regarding the beach and its value to them. At this point, participants could choose to complete the online survey. The invitation to participate and the survey are presented in Annex 2.

Survey analysis

The survey gathered information on respondents' emotions, visitation rates, use, values, and perceptions. The data collected was analysed to explore: (i) beach goers' perceptions and values of the coast at a select point in time, both for the PNP region and individual beaches therein; (ii) variation in perceptions and values across beaches in the PNP region; and (iii) change in values and perceptions over time under varying beach conditions. In addition, the results provide evidence of the utility of the data collection method, and can inform regional and long-term coastal planning and management in the PNP region.

The data was analysed in Qualtrics StatsQI statistical analysis package, using ANOVA and cross-tabs where appropriate. Data was analysed to explore significant differences in values, use and perceptions based on (i) CoastSnap site visited; (ii) frequency of visitation; (iii) perceived condition of the beach or foreshore; and (iv)emotional engagement. Results are reported as significant where $p < 0.05$. This is a long-term initiative and the value in the program will increase over time as more survey responses are contributed by CoastSnap users. To date, the response rate allowed for comparative analysis across three beaches in the PNP region: Busselton Jetty, Busselton; Shoalwater Bay, Rockingham; and Dalyellup, Capel (referred to as PNP focus beaches herein).

Results

Response rate

In the seven months of operation from mid-December 2021 to mid-July 2022, 95 complete survey responses were received. The proportion of CoastSnap users in the PNP region that go on to complete the social values surveys is approximately 19%. This is almost double the average response rate for a non-incentivised survey (which receives a response rate of approximately 10%[1]). Most responses were received from Dalyellup (Capel), Busselton Jetty (Busselton) and Shoalwater Bay (Rockingham). All survey respondents had uploaded a CoastSnap photo.

CoastSnap provides an opportunity for citizen scientists to regularly contribute images of the coast. As such, many CoastSnap sites are frequented by repeat users. It is unlikely that, for example, daily visitors will complete the survey on each visit. Therefore, to gain a better appreciation of survey response rate, we compared the number of 'first time' survey respondents with the number of unique CoastSnap users at each site (Table 2). In some locations (e.g., Eaton, Bunbury) response rate was as high as 50% (Table 2).

There was a slightly higher response rate in summer than winter; but there remained consistent engagement during the cooler months (April – July). Some locations have more repeat responders than others, which is a function of the CoastSnap user group at each beach. For example, Busselton with high tourist visitation has a significantly higher proportion of first-time respondents, while Dalyellup has a significantly higher proportion of repeat respondents, with most responses coming from a regular and committed respondent at this site.

Table 2: Number of survey responses and CoastSnap images, per CoastSnap site, PNP region, mid-December 2021 to mid-July 2022.

	Real-time social values survey			**CoastSnap photos**		**Response Rate**	
Site	Surveys (total)	# First Time respondents	# Repeat respondents	Total # uploaded	Unique user uploads	% Total	@ FT / Unique
Binningup	10	7	3	68	21	14.71%	33.33%
Busselton Jetty	25	24	1	128	97	19.53%	24.74%
Dalyellup	25	4	21	115	11	21.74%	36.36%
Eaton	2	1	1	7	2	28.57%	50.00%
Koombana Bay	3	2	1	26	15	11.54%	13.33%
Shoalwater	23	17	6	100	49	23.00%	34.69%
Silversands	7	7	0	54	32	12.96%	21.88%
Total	**95**	**62**	**33**	**498**	**227**	**19.08%**	**27.31%**

Just under half (43%) of all respondents went on to complete Part 2 of the survey when invited. This equated to 33% of first-time respondents and 59.4% of repeat respondents (down from 82% of repeat respondents in the first three months of implementation). This suggests that while

[1] See https://peoplepulse.com/resources/useful-articles/survey-response-rates/

repeat respondents are more likely to complete Part 2 of the survey than first time users, their willingness to complete may decrease over time.

Respondents

Most (99%) respondents were Australian citizens and regular visitors to the beach where they had taken the image. Half of the respondents (51% visited either daily or weekly), while 18.4% (16) respondents visited rarely. Most were Australian residents (98.9%) and travelled less than 10 km to get to the beach, with a median distance travelled of 5 km across all beaches. However, this ranged from a median travel distance of 0.3 km at Dalyellup to 90 km at Busselton Jetty.

Coastal activities

We wanted to know how people were using the coast and the relative importance of different activities to them. When considering responses across all beaches, nature-based activities (e.g., wildlife watching, conservation work) were the most important activities for the survey respondents (Figure 2). Water based activities were considered of least importance (e.g., swimming, surfing, boating). This result could reflect the time of year responses were collected, with an additional month of data collection during winter; or a tendency for frequent visitors to visit for emotional and nature-based interaction that is not reliant on 'stepping into' the ocean.

Significant differences in the importance of coastal activities were identified across the three focus beaches. In Busselton, foreshore-based activities (e.g., exercise, visiting attractions, spending time with friends or family) were prioritized by respondents. While water-based activities (e.g., swimming, surfing, boating) were more likely to be important to Shoalwater respondents, than for Dalyellup or Busselton Jetty respondents. What remained consistent across the three beaches, however, was the high priority of nature-based activities.

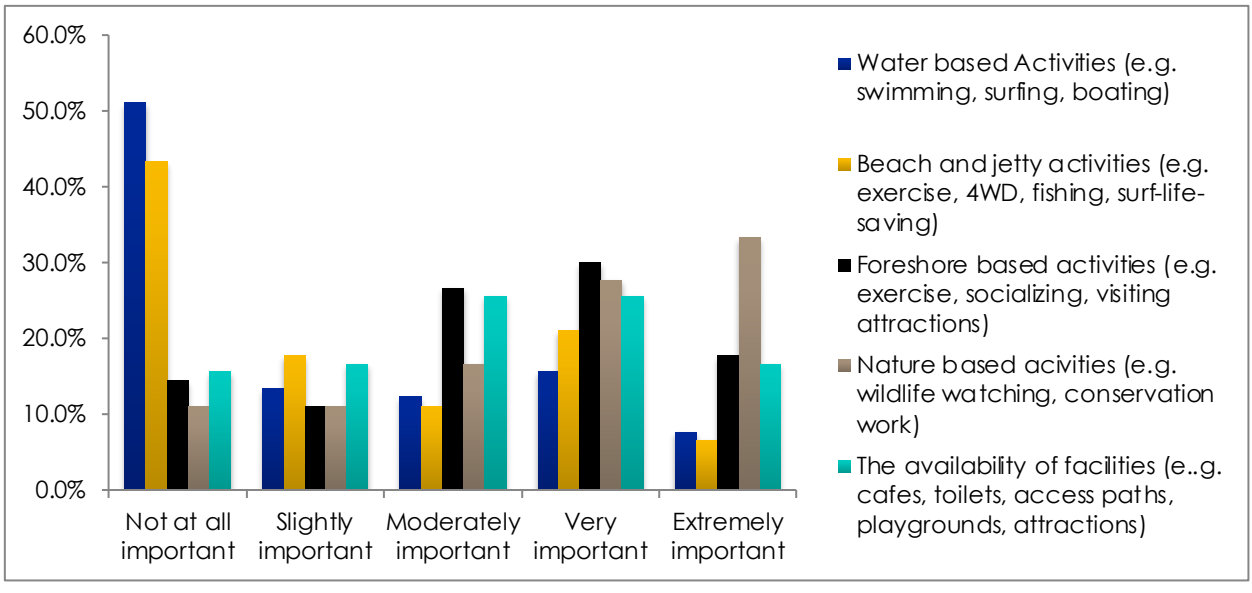

Figure 2 Importance of coastal activities to the survey respondents

The data collected also allowed us to examine how beach use differed based on how often the respondent visited the beach. We found on average across all surveyed beaches, respondents that infrequently visit the beach place more importance on facilities, such as toilets, showers,

access paths, cafes, and playgrounds, compared to those that are frequent visitors. Therefore, it is the occasional or seasonal visitors who value access to and quality of facilities, while regular visitors see these as less important.

With respect to activities themselves, we found those that visit the beach more regularly place greater importance on water-based activities. We also found that frequency of visitation did not influence the importance assigned to nature-based activities. Nature-based activities were rated highly regardless of visitation rate.

Benefits

We asked respondents what benefits they gained from visiting the beach: physical health, mental/emotional health, spiritual or cultural well-being, and social wellbeing. The most important benefit gained was mental/emotional health (Figure 3). This is reflected in the emotions respondents felt when 'looking at the beach' with 72.1% reporting they were happy, and 15.4% noting they were surprised, 4.8% worried and 2.8% sad (Figure 4). The importance of these benefits did not differ significantly across the three focus beaches.

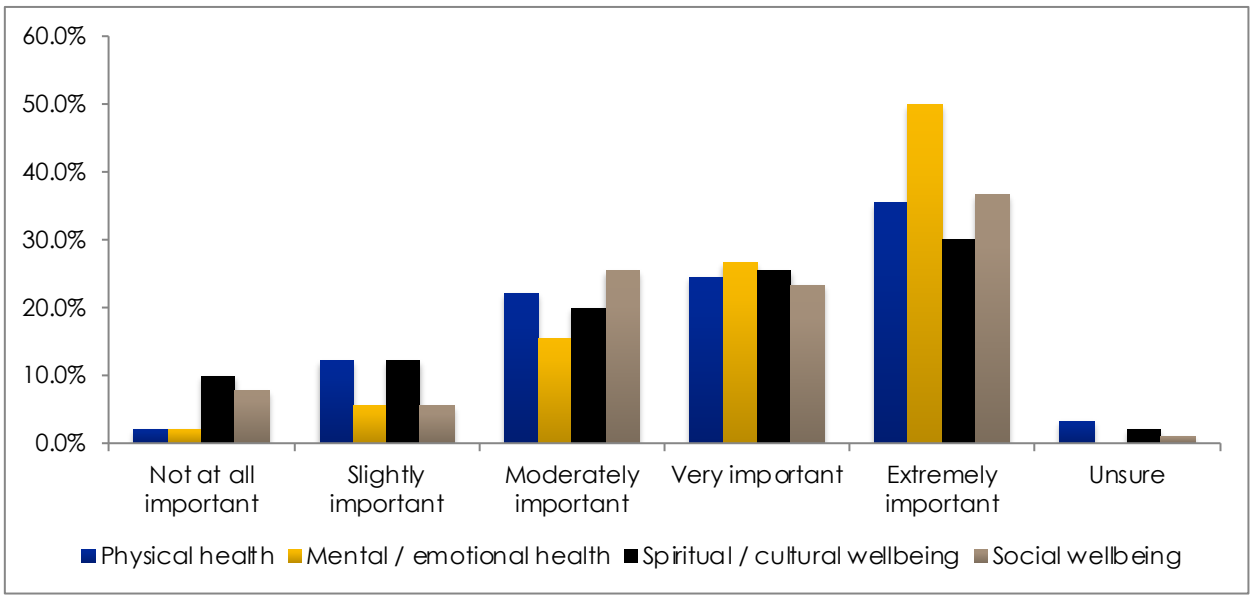

Figure 3 The importance of benefits obtained from visiting the beach

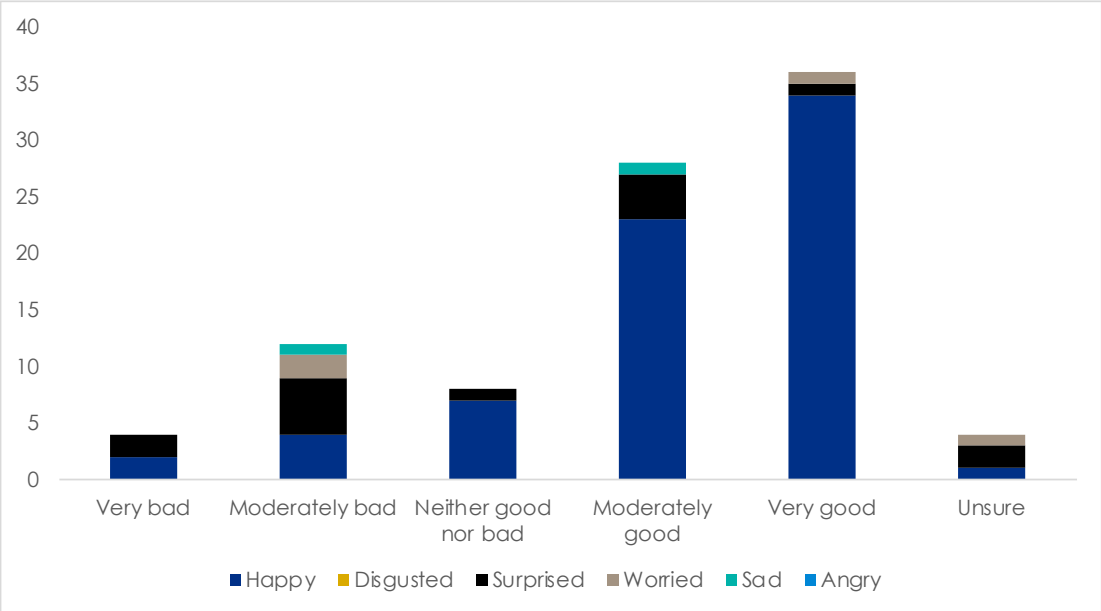

Figure 4 Emotional response when viewing the beach. Note: Value indicates the number of times the emotion was selected. Respondents could select more than one emotion.

The condition of beaches and facilities

We sought to explore how respondents' perceptions of coastal condition related to their use of the coast. Across all beaches, foreshore condition was predominantly considered good and dune condition moderate (Figure 5). Ocean condition received the most negative responses. There were identifiable differences in the perceived condition by beach, for example the foreshore was more positively rated in Busselton and Dalyellup compared to Shoalwater, while dune condition was perceived to be more positive in Shoalwater than Busselton and Dalyellup. In 91 percent of cases, the condition of the coast did not affect the respondent's ability to undertake the activities they sought. However, for those that reported condition impacted use, water-based activities and foreshore-based activities were most frequently impacted (50% of cases respectively), and ocean-condition (e.g., waves and rips) the primary factor affecting use (87.5% of cases).

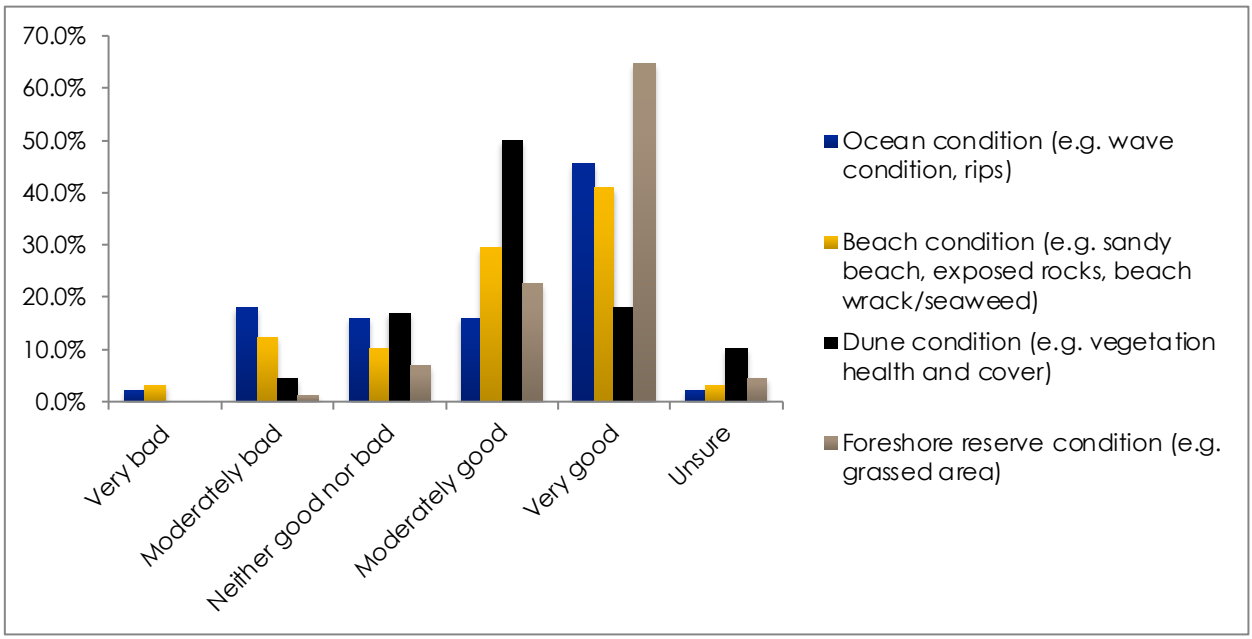

Figure 5 Condition of coast on day of visitation.

Connection to nature influences emotional well-being (Coventry et al 2021; Richardson et al 2020). By collecting information on respondents' emotional reaction to the beach, we sought to explore the relationship between perceived condition and emotional well-being (Figure 6). 'Happy' was the dominant emotional reaction to the beach, with a limited number of respondents selecting other emotions. Consequently, statistical analysis of the relationship between emotion and beach condition is not currently possible. However, visual review indicates respondents were often unsure of the condition of the foreshore and ocean, but more certain of the condition of the beach. Those that were rated their emotional reaction to the beach as 'surprised' were more likely to perceive its condition as moderately bad than those that experienced a 'happy' emotional response. The findings, though preliminary and requiring additional data to verify, suggest that beach condition can influence emotional response.

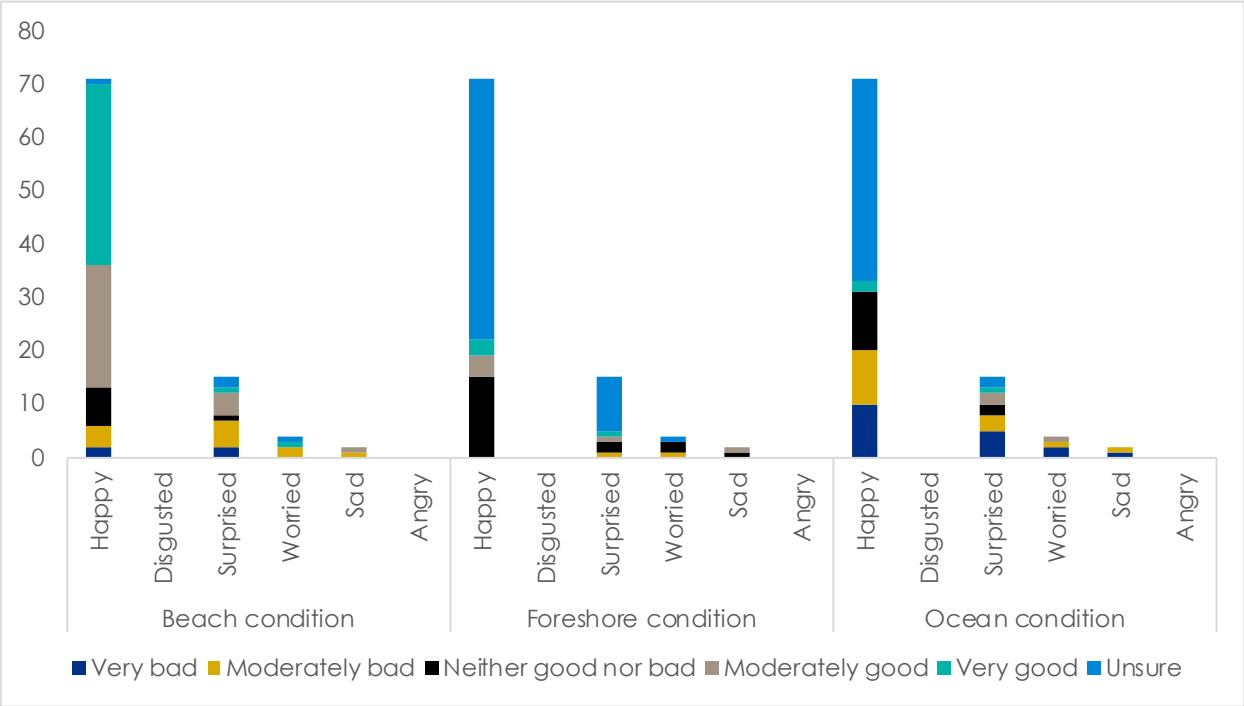

Figure 6 Emotional reaction to the beach, by reported beach condition (all sites) Note: Value indicates the number of times the emotion was selected. Respondents could select more than one emotion.

Table 3 Suggestions for improving the beach, by location.

Site	Responses to: 'Any suggestions to improve this beach and/or foreshore area?'
Shoalwater Bay Rockingham	I would like to see a general ban on recreational fishing in the Shoalwater Islands marine reserve. The disregard for the conservation of the area by this particular group of users is untenable. Plastic waste, wildlife entanglements and boat strikes, and dunes used for human waste, are just some examples. Monitor recreational fishing activities and provide better information on site about the impact of their activities. E.g., plastic bait bag disposal, dealing with snagged birds, burley oil and offal pollution. Continue to maintain and don't over develop the area. No - we love this local dog beach More seating/relaxing/eating areas to look on the water Can we somehow utilise the excessive seaweed in fertiliser? Remove the seaweed No suggestions (x5)
Henson St Mandurah	The shipwreck info needs to be more accessible. Fence in the way, can't read info, too small. Make the dune restoration area more attractive for wildlife to survive No suggestions (x2)

Site	Responses to: 'Any suggestions to improve this beach and/or foreshore area?'
Binningup Harvey	Some signage/ information about the reef offshore from Binningup, with photos and information about the importance of the different types of sea weeds and marine life that inhabit the reef, as I have only recently discovered what a great snorkelling spot Binningup is for viewing a diverse range of seaweeds and fish/ rays. And the importance of the reef in protecting the beach from erosion during winter storms " Disability access to beach near Surf Club during the summer period now the bollards are up. A shower facility for kids that is not in an exposed area. Toilet blocks need up grading; Enclosed showers would be nice; Hot water for showers; BBQs fixed (not working / out of order for some time); fish cleaning station; more parking; pay lifeguards for doing such a great job Love the new park area! Very well maintained Without sounding unpopular, get the 4WD off it. I grew up 4WD on ninety-mile beach in VIC as a kid but considering buying a holiday house here for my family now that is a big drawback, let alone what it is doing environmentally. Access to a specific boat ramp or jetty excluded. Good luck with the research project team. Keep up the good work.
Koombana Bay, Bunbury	No suggestions
Dalyellup, Capel	Rehabilitation of paths people have cut through dunes. Rehabilitate degraded dunes. Put more effort from the shires to block paths through the dunes and direct people onto the paths. Block access where people are pushing tracks through the dunes. Move dog bag dispenser to a sheltered location so the wind doesn't pull them all out in a single event Put more effort from the shires to block paths through the dunes and direct people onto the paths. More work by local councils to control unrestricted access Less mothers on Mother's Day. They should still be in bed! Council needs to move dog bag dispenser. Every strong wind the whole roll ends up in the bush People were driving on the beach which is disappointing Bin for beach rubbish there was a lot washed up and washing up today Dune rehabilitation work Needs interpretive signage for the area No suggestions (x3)
Busselton Jetty, Busselton	Environment over people - let's protect coast for our kids future The dune area is highly modified, there is little dune vegetation even in the natural dunes nearby. Nearby dunes could have better vegetation cover Nothing was open, maybe something that opens sooner Environment over people - lets protect the coast for our kids future

Site	Responses to: 'Any suggestions to improve this beach and/or foreshore area?'
	Liked the interpretive signs on jetty and at the playground near Equinox Cafe
	No suggestions (x4)

Beach change

Respondents' views on whether the beach was eroding or accreting varied across sites. There were significant variations in perceptions of change (erosion, accretion or stable) (Figure 7) and the drivers of change by beach (i.e., daily tides, storms, sea-level rise, coastal development, unsure) (Figure 8). Accretion was reported at Dalyellup, while remaining beaches were considered stable, eroding or respondents were unsure (Figure 7).

Users were also invited to describe the changes they had seen since their last visit to the beach (in Part 2 of the survey). For 97% respondents, this was not their first visit to the beach in which they took a CoastSnap photo; and 63.89% had noticed a change since their last visit. These responses (Table 4) along with suggestions for improvement (Table 3) provide coastal managers with information on issues affecting use and values.

Also in Part 2, respondents were asked their agreement with the following statement: I am concerned about the impacts of climate change on coasts generally. More than half of the respondents (59.46%, 22) strongly agreed with the statement, with 24.33% (9) agreeing; compared to 7.1% (3) that disagreed or strongly disagreed. 67.7% reported they were very aware of the general impacts of climate change on coastal areas, with the remainder stating they were aware. No respondents selected limited or no awareness or that they did not accept climate change was occurring.

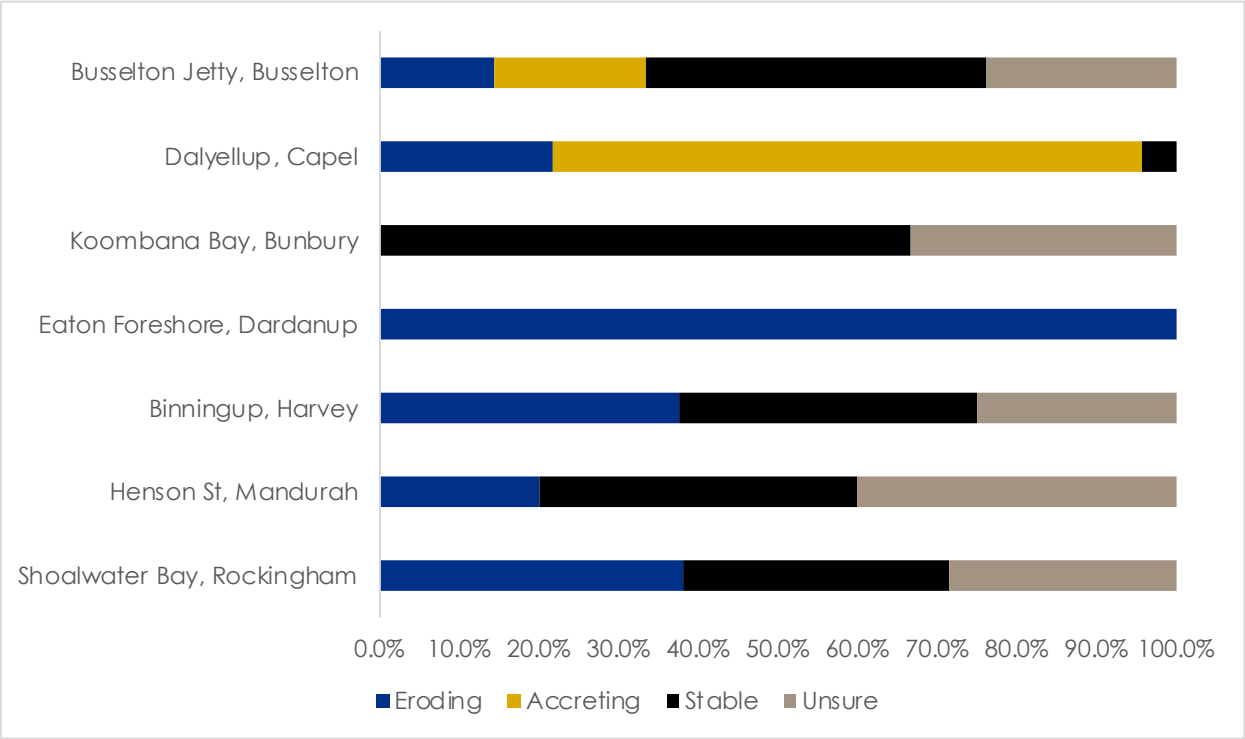

Figure 7 Perceptions of beach change: erosion, accretion or stable

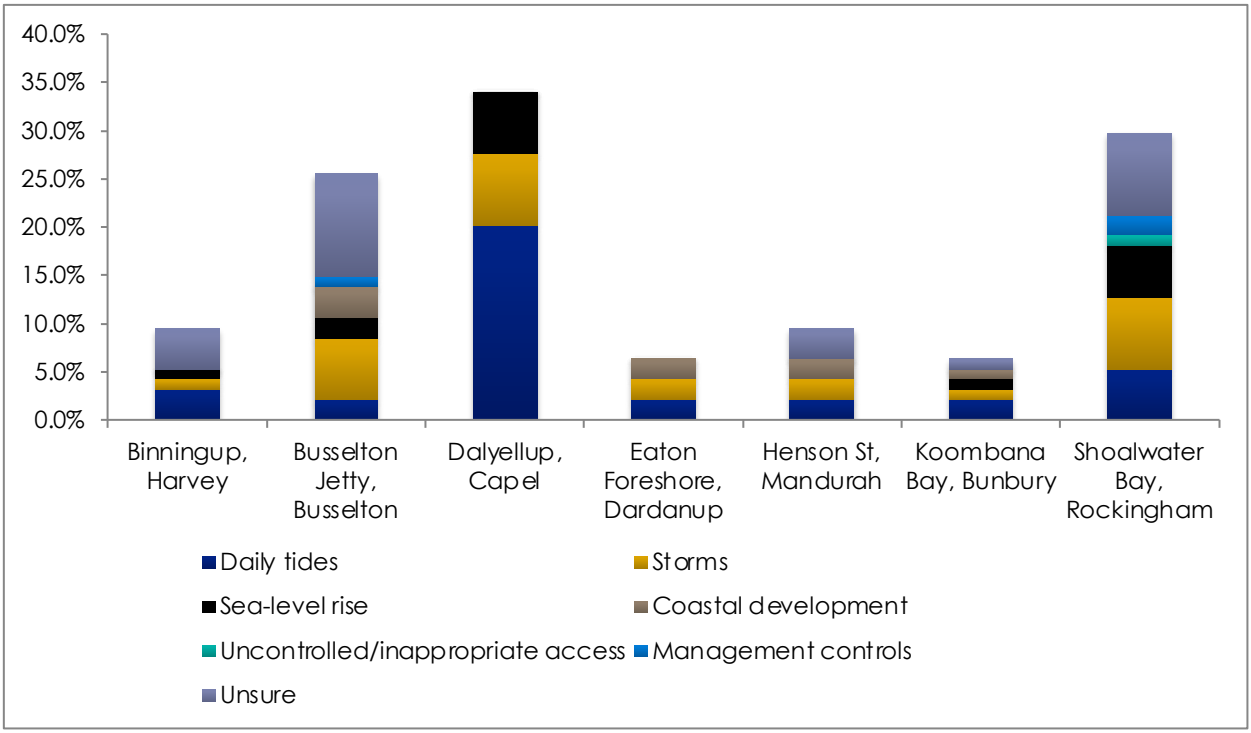

Figure 8 Perceived drivers of beach change, by CoastSnap site, PNP region.

Table 4 Reported change since respondents last visit to the beach

Site	Comment
Shoalwater Bay, Rockingham	Erosion of Mersey point. Unfortunately, the coast cam looks north. However, it is apparent that the sand is moving from the point to this beach, giving the illusion of accretion, when overall, erosion is occurring Every winter, the storm swells change the dunes dramatically. This particular CoastSnap location shows how much the beach and dunes can change north of the jetty. Both with erosion and accretion. However, the view south of jetty is the most alarming. Mersey point is eroding. It's sand seems to be landing on the north side. More weed Seaweed previous washed up due to storms is clearing naturally.
Kombana Bay, Bunbury	The water is different colours Water higher up the beach. Sand deposited further up the beach.
Dalyellup, Capel	There was more damage in the dunes from people walking through them and damaging the environment. The wind had blown all the dog bags out of the dispenser, again, and they were all caught up in the bush. Beach is starting to show signs of winter with less foot traffic more commercial fisherman traffic and pool of water More height to beach sand brought in by waves Tides are getting higher Swell much bigger but still not racing as far up the beach as last year at the same time using base of the states as an example reference point Beach has been badly eroded by storm and is now very flat with waves and surge washing onto base of the dunes Seaweed more sand new tracks into the dunes Seaweed that had built up is now covered with sand. The sand flats are horrendous right on dawn. Less rubbish than I expected after the storm. Only one piece of rope Less beach from storms high tides Almost no beach from the storm. The waves are washing up to the base of the dunes
Binningup, Harvey	Sand level has declined. More limestone wall visible and significantly less weed evident Beach to left hand side of boat lunching area is eroding/ retreating
Busselton Jetty, Busselton	The beach sand has recently accreted in recovery from winter storms. Over the last 5 years there has been significant accretion beneath the Busselton jetty interpretive centre Seasonal changes of increased beach size Sand washing away quite quickly
Eaton Foreshore	High water level, high tide has just past but incoming cold front holding water here. Driftwood and vegetation Washed up. Driftwood and river debris deposited on the grass and against the wall.
Henson St, Mandurah	The level of sand is less

Economic value

Survey questions to allow a Travel Cost method were incorporated to understand the economic value of beaches in the PNP region. Questions explored visitation (the number of visits in the last 12 months, how many people come with the respondent when they visit the beach), transport (the most common mode of transport to get to the beach, how far they travel to get to the beach) and other activities (any stops at other places during the same trip, e.g. visit while going to/from work, school, grocery shopping, or stop at a café, etc).

Most respondents were regular visitors (Figure 9), visiting alone (48.4%) or with one other adult (39.4%). Half of the respondents walked to the beach (52.8%), the remainder drove a car, with a distance ranging from 0.25 – 300 km (mean 47.9 km, std dev 89.9km). Three quarters (75.3%) visit the beach and return home without stopping before or after.

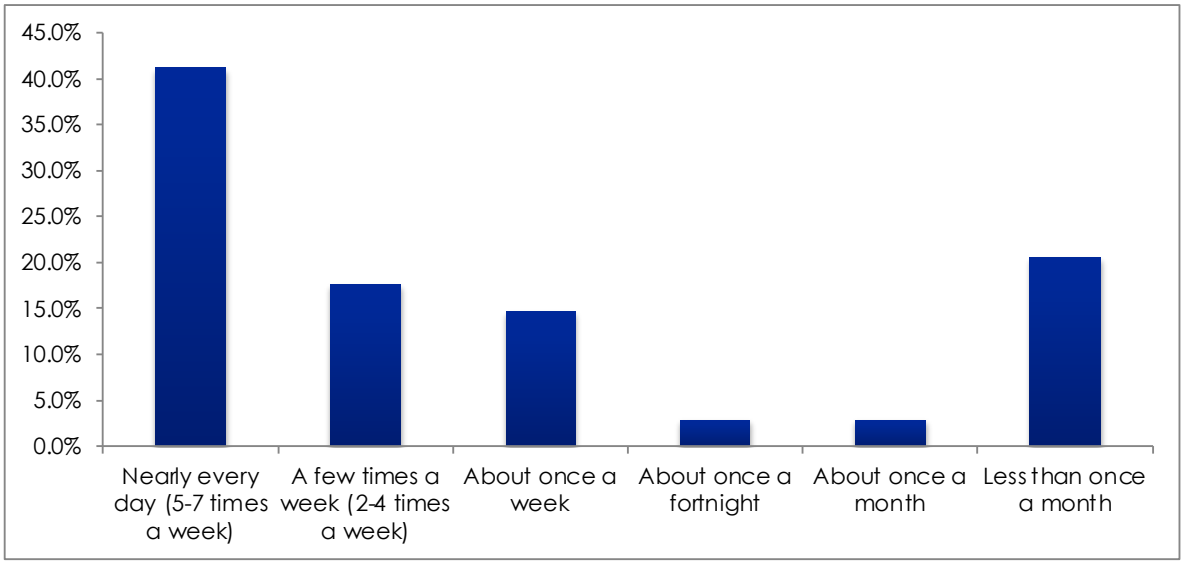

Figure 9 Frequency of visitation in the last 12 months.

Part 2 of the survey, which contained the questions to conduct the Travel Cost method, was completed by 37 respondents in total. This ranged between 1 and 7 unique (first-time) visitors at each beach. The Travel Cost method requires a reasonable sample size to conduct the statistical analysis. Samples of greater than 50 individual respondents are likely to be needed for a single location, or greater than 100 over multiple locations (that are still in a reasonable proximity, e.g., 10km), depending on the heterogeneity of the sample. As such, the Travel Cost method could not be performed.

Linking survey responses to CoastSnap images

In addition to a low-cost method to obtain information on how people use and value the beach, a key attribute of partnering with the CoastSnap system is the ability to relate respondent use and values to an 'image' of the beach at a particular time (see Figure 13). This provides additional context to understand user's emotional engagement with the beach and can provide evidence (i.e., image) to better understand respondents perceptions of beach state and condition.

Linking respondent's emotions to time-lapse images of the beach indicates that respondents notice and are surprised by beach change, either short term erosion, the presence of beach wrack or human impact (e.g., vehicle tracks on the beach) (Figure 10, note this image is interactive in the electronic version, see the WACoastSnap FB page for more interactive examples).

Figure 10 Respondents emotional response to the beach

Furthermore, we can explore change in values and perceptions over time and under different beach conditions for both individual and multiple respondents. The former allows researchers or managers to explore how beach condition (as shown in the uploaded CoastSnap image) relates to an individual respondents use (Figure 11) and values (Figure 12).

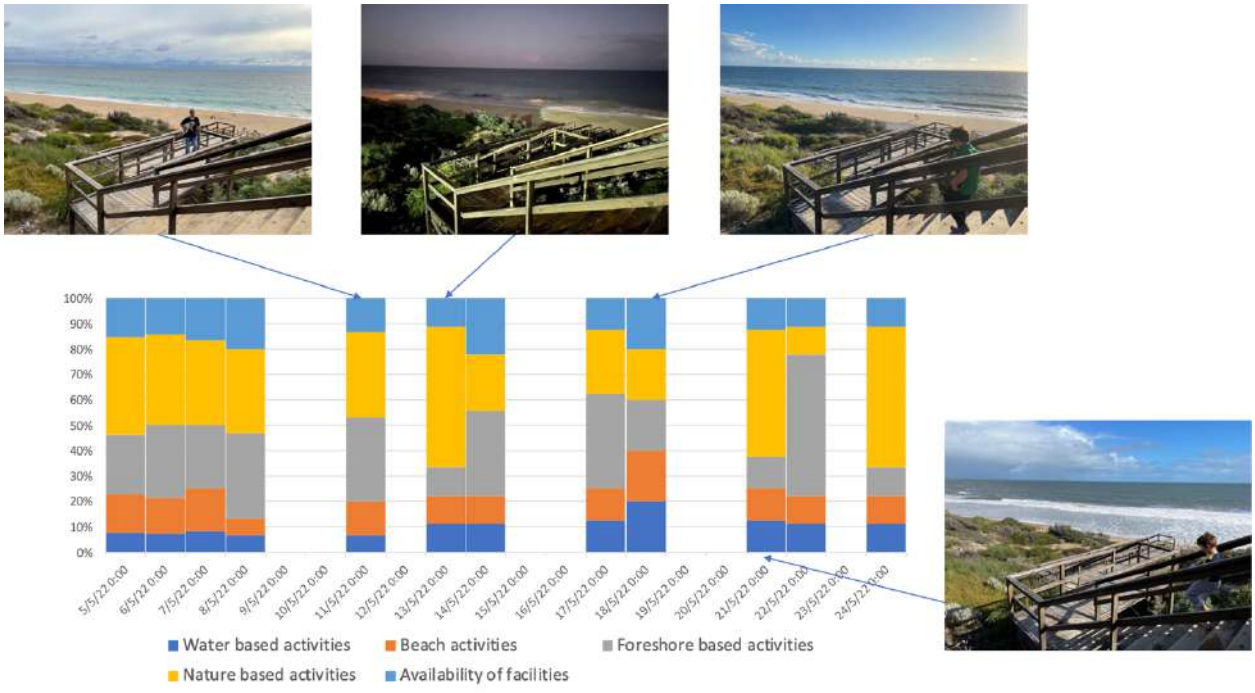

Figure 11 The importance of beach uses for respondent 0409 when visiting Dalyellup beach, May 2022

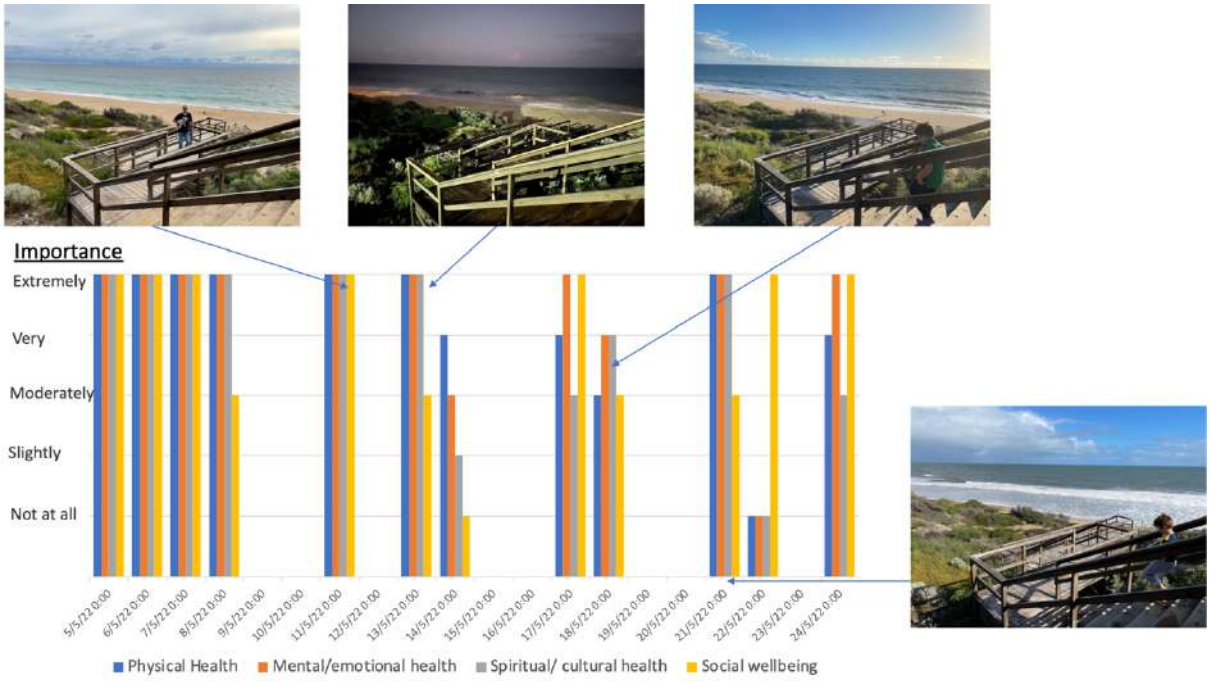

Figure 12 The importance of benefits gained from visiting Dalyellup beach, for respondent 0409, May 2022

ID 12 Binningup December 18 2021

- Repeat User
- Emotion: Surprised
- Activities affected: Water-based
- What affected activities: Ocean condition
- Coastal change: Stable
- Cause: Daily tides
- Visitation: Weekly
- Improvements: Not stated
- Reported changes since last visit: Sand level has declined. More limestone wall visible and significantly less weed evident

ID 13 Busselton Jetty; December 14 2021

- First time User
- Emotion: Happy
- Activities affected: None
- Coastal change: Accreting
- Cause: Daily tides
- Visitation: Occasionally
- Improvements: Nothing was open, maybe something that opens sooner
- Reported change since last visit: No change

ID 11 Busselton Jetty, December 16 2021

- First time User
- Emotion: Happy
- Activities affected: None
- Coastal change: Accreting
- Cause: Development
- Visitation: Weekly
- Improvements: The dune area is highly modified, there is little dune vegetation even in the natural dunes nearby
- Reported change since last visit: The beach sand has recently accreted in recovery from winter storms. Over the last 5 years there has been significant accretion beneath the Busselton jetty interpretive centre

ID 20 Busselton Jetty, December 20 2021

- First time User
- Emotion: Happy
- Activities affected: None
- Coastal change: Unsure
- Cause: Unsure
- Visitation: Rarely
- Improvements: Not stated
- Reported change since last visit: Not stated

ID 17 Dalyellup, January 5 2022

- Repeat User
- Emotion: Happy
- Activities affected: None
- Coastal change: Accreting
- Cause: Daily tides
- Visitation: Daily
- Improvements: Rehabilitation of paths people have cut through dunes
- Reported change since last visit: No change

ID 14 Dalyellup, December 30 2021

- Repeat User
- Emotion: Happy
- Activities affected: None
- Coastal change: Accreting
- Cause: Sea-level rise
- Visitation: Daily
- Improvements: Rehabilitate degraded dunes
- Reported change since last visit: More rubbish from people having parties on the beach

Figure 13 Example survey responses linked to CoastSnap images

Discussion

This project sought to fill a gap in knowledge regarding the social value of beaches in the PNP region. We tested an approach to obtain information on how people use and value beaches that requires limited resource investment post survey design. It was anticipated that this data collection approach would provide a novel and valuable contribution to existing social values data collection approaches, which are often resource intensive and provide only a snapshot of use and value at one point in time.

In the first seven months of data collection, this project has successfully achieved several objectives. It has engaged the CoastSnap community in the collection of information regarding the coast and its value to them. In some locations, this has predominantly been through repeat, regular beach users. Their continued participation in the survey demonstrates ease of use and perceived benefits in contributing to coastal management. The data collected demonstrates the capability of this approach to contribute to a long-term social values dataset that will assist in the protection and management of the coast, meeting an identified gap in the PNP Regional Coastal Monitoring Program.

The results to date demonstrate the affective relationship visitors in the PNP region have with the coast. Most survey respondents visit beaches in the region for nature-based activities, with mental/emotional health the most important benefit gained from their visit. The importance of nature-based activities was universal, with no significant differences across the three focus beaches or based on frequency of visitation. This is an important finding for the region. It demonstrates a relationship that was assumed, yet not empirically established – that respondents have an affective relationship with the beach and this relationship supports emotional health. This finding also aligns to other research reporting the importance of a connection to nature in physical and emotional health (Gascon et al 2017; Coventry et al 2021) and in environmental conservation and pro-environmental behaviours (Richardson et al 2020).

For our respondents, the condition of the beach and foreshore rarely affected their ability to conduct their intended activities. While there were differences in the perceived condition of the dunes and foreshore across the focus beaches, this rarely impacted use. This suggests coastal condition is not currently impacting visitors' affective relationship with the beach. Furthermore, respondents' perceptions of change were mostly 'natural' (storms and tides) and related to the seasonal movement of sand, with an overall view that beach and foreshore condition was good. This suggests if the foreshore/beach is seen as pristine/natural/undergoing natural change, then perceptions of change will be positive. Anthropogenic disturbance to the natural environment (e.g., rubbish; vehicle tracks) can impact an individual's ability to realise emotional benefits and they will view the beach negatively and may go elsewhere (Elrick-Barr et al, *in preparation*). We found users noticed change in beach condition and those whose emotional reaction was surprise were more likely to perceive condition as moderately bad compared to those that experienced a happy emotional response.

A key attribute of aligning a social values survey with the CoastSnap platform is the ability to explore difference in use and value across beaches and over time. Survey results to date mean comparisons could be performed on three of the seven CoastSnap monitored beaches. We found differences in the priority assigned to activities, with water-based activities more important

for Shoalwater respondents than Busselton or Dalyellup, and foreshore-based activities more important for respondents to Busselton than Shoalwater. As population grows and the impacts of climate change are increasingly felt, regional scale planning will become increasingly important to develop nodes of use and activity. By understanding how visitors interact with the coast, and the values assigned to interactions, coastal managers can make informed decisions regarding planning (e.g., activity nodes) and management interventions (e.g., retreat, accommodate, protect), along the coast.

In the long-term, data collected will demonstrate changes in use and value over time, and the impacts of interventions (e.g., erosion control measures, new recreational facilities) on use and value could be explored. The collection of temporal data on social values is rare yet provides important input to strategic coastal planning.

Highlights

The CoastSnap citizen science initiative relies on repeat and regular contributors. In some PNP CoastSnap sites (i.e., Dalyellup), there are high image uploads from repeat visitors (e.g., one visitor with almost daily contributions). It is not expected that such contributors would also complete the social values survey at each visit. Consequently, the response rate received to date exceeds expectations, with an average 27% response rate when excluding repeat visitors.

Some key benefits of the project to date include: (i) obtaining an understanding of the use, condition, and values of PNP beaches for a segment of users, (ii) real-time reporting of issues that can be monitored by local governments to obtain immediate feedback when issues arise or on management actions taken; and (iii) an understanding of how use and perceptions vary by location.

Future considerations for PNP local governments

The response rate did not enable analysis of the economic value of the beaches. We opportunistically included questions to enable estimation of a travel cost model, as the question set was concise. However, it was anticipated at the outset that it was unlikely we would achieve a sufficient sample size, as this economic analysis typically requires approximately 100 unique respondents per site and does not benefit from temporal data. As such, this mode of data collection, while providing substantial value from a social values perspective, was not conducive to economic analysis during this 7-month reporting period, particularly because a large proportion of the respondents completing Part 2 were repeat rather than first time users. Local government partners may wish to consider the ongoing utility of questions relating to travel-cost (approximately 3 questions).

At the outset of the project, we sought to track individual's responses over time, by allocating respondents a unique ID code they could enter when repeating the survey. We found that repeat users did not remember their allocated unique ID (despite being emailed to them for their records), so we changed the approach to allow respondents to allocate their own 4-digit code. While in some cases repeat responders re-entered their self-assigned code, the use of 4-digits, while more easily remembered, has the potential for users to select the same code (e.g., 1111). This could be particularly problematic in locations with higher response rates. Alternate

opportunities to trace responses over time, whilst maintaining participant anonymity, should be investigated.

Surveys were linked to CoastSnap images by time and date of photo and survey submission. When survey respondents did not complete the survey at the time of uploading the CoastSnap image, it was difficult to link survey response to image. While this was not a common occurrence, future applications might consider additional ways to link surveys and images. For example, for example, adding an additional question to the survey that asks, 'When did you take your CoastSnap photo?' with the options, 'Just now' or 'Other'. Those selecting 'Other' would be asked to insert time and date of photo.

Finally, as with all participatory data collection programs, knowledge and awareness is key to increasing engagement. During the pilot program, PNP representative Craig Perry delivered two radio interviews, one media release and posted preliminary survey results (from the 3-month project report) on the CoastSnapWA Facebook page. It was clear from responses to the Facebook posts, seeing the results provided impetus for respondents to continue to contribute to the survey. It is recommended that results are shared and reported at regular intervals (e.g., 6 monthly) to maintain engagement.

Next Steps

Survey review

This pilot project has provided the infrastructure for PNP local governments to collect long-term information on the use and value of their beaches. The outputs can be reviewed at regular intervals, to inform ongoing data collection. This may mean the removal of survey questions and the inclusion of others, depending on research and management priorities. For example, the pilot has demonstrated that within the PNP region, survey questions for travel cost assessment could be removed. We will continue to work with the PNP to tailor the survey to their needs.

Expansion of the pilot program

As the number of CoastSnap users grows through either the installation of CoastSnap infrastructure to more West Australian beaches, or through the inclusion of a similar survey in the CoastSnap app, which allows users to upload images from any coastal site where there is no 'infrastructure' (as available globally, but not currently widely adopted in Western Australia), there is the potential to expand the survey and collect additional data on beach use, condition, and values. Through the inclusion of additional beaches, covering a range of contexts (e.g., urban, regional and remote; tourist versus residential; cross-jurisdiction) the value of the tool as a comparative and longitudinal data source will increase. The research team will continue to explore possibilities to expand the pilot program.

Sharing lessons learned

The results of the pilot program will be shared at the WA State NRM and Coastal conference in September 2022. In addition, a peer-reviewed paper is being prepared for submission to a high-impact international journal.

Conclusion

At the outset of this project, we sought to provide an additional and complementary data set on the social value of PNP beaches, meeting an identified gap in the PNP coastal monitoring program. The project has demonstrated the value of this innovative approach to social value data collection. A value that will increase over time through the long-term collection of data on the use and value of PNP beaches. This data will enable longitudinal analysis of change in values and use over time, under varying beach conditions or other man-made interventions in the coastal zone (e.g., recreational facilities or protective works). The ability to compare use and value across beaches can also play an important role in informing strategic coastal planning. The results provide evidence to support ongoing collection of data in the PNP region and expansion of the program to other areas.

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Annex 1 Non-market valuation (NMV) options

NMV is an economic approach that equates intangible values (social and environmental outcomes) with monetary values (financial outcomes) by understanding people's (hypothetical) willingness to pay for to maintain or improve particular environmental attributes.

The ability to estimate non-market values in this way makes them commensurate and comparable with financial benefits and costs in decision making. These values can be used in quantitative decision analyses, like benefit-cost analysis, so that the intangible impacts of a decision are explicitly considered alongside the tangible impacts that are often more readily expressed.

Some NMV methods focus on use-related values of a site, e.g., recreation value. Others are more holistic and can estimate 'total economic value', including non-use related values, such as the existence value of the environment.

NMV data is usually collected via a dedicated survey, as the questions can be complex, and a decent sample size is required for statistical analysis, usually at least 100 survey responses, give or take, depending on how heterogeneous the sampled population is.

Here we are interested in the opportunity to see whether or not we can achieve a reasonable sample size for a simplified set of NMV questions, so that we can collect quantitative economic information about coastal values, alongside the other data being collected.

Three potential NMV methods may be flexible enough for consideration, given the survey mechanism, outlined below.

1. Travel cost method (TCM)

TCM is used to measure values associated with recreation. It uses information about the costs associated with making a trip to visit a site to infer how much people are willing to pay for each visit.

It tells us about the use-related value of the site, in its current condition (i.e. it does not predict how value will change if the condition of the beach changes).

Example questions:

- Q1) In the last 12 months, how often on average have you visited this beach?
    - Nearly every day (5-7 times a week)
    - A few times a week (2-4 times a week)
    - About once a week
    - About once a fortnight
    - About once a month

- Less than once a month

- Q2) How many people usually come with you to this beach?
  - ____ adults
  - ____ children
- Q3) What is the most common mode of transport you use to get here?
  - Walk
  - Bicycle
  - Motorcycle
  - Car
  - Bus / train
  - Other _____
- Q5) Based on this mode of transport, how far do you usually travel to get here, and how long does it take?

_____ km and _____ minutes

- Q6) Is this the only place that you stop at on a regular visit here, or do you also stop at other places during the same trip (e.g. visit while going to/from work, school, grocery shopping, or stop at a café, etc)?
  - Yes, I usually come straight here and then return home
  - No, I usually make other stops before or after I come to this beach

TCM advantage: simple, easy set of questions to answer

TCM disadvantage: only gives an indication of current recreational use value

2. Contingent valuation (CV)

CV estimates the value of a potential environmental management policy or program by asking people how much they would be willing to pay for it.

CV provides a measure of the total economic value of the environmental asset (it can encompass non-use values).

It can be forward looking, by estimating values in relation to anticipated changes to the coast and defining a management program that would avoid/reduce/improve on any negative impacts, for example a program to control erosion.

Implementing a CV exercise can become quite complex and requires careful survey framing – while the questions are hypothetical, they need to appear as realistic as possible to induce an honest answer.

- The value estimated is specific to the outcome achieved by implementing the defined policy context. This means it would require definition of a program/policy to deal with a management issue that can be asked about a specific site, but that would be generically applicable across the multiple coastal locations involved in CoastSnap (so that the same type of question can be asked at another site).

- The potential changes (improvements) in environmental outcomes as a result of the policy/program need to be clearly defined – if it is about protecting a length of beach from erosion, what length is protected (in absolute terms; and that no doubt varies by location)?

- It needs to be made clear that the (hypothetical) payment requested is for implementation of the policy/program at the site in question only, and not for other locations.

- The payment mechanism needs to be plausible: things like entry fees will not work as we don't charge those for our beaches; council rates only work for locals living in the area; State levy's still need a way to be collected (e.g. possibly still via council rate payments, as for the Emergency Services levy, with clear statement that charges are passed by landlords on to people who rent).

Example question

- We experience coastal erosion at this beach every year, particularly during the storm season. The erosion is leading to a reduced availability of beach space for recreation. Over the next 10 years, we expect that about half of the beach space that you can see now will be lost to erosion if we do not increase our management efforts. We can implement a beach nourishment program, where we cart sand in to control the erosion, to maintain the current beach space over this 10 year period.

Would you be willing to pay a one-off contribution via a State Management Levy to implement a beach nourishment program for this beach?

No, I would not be prepared to pay.

Yes, the maximum amount I would be prepared to pay is:

$1	$10	$40
$2	$15	$50
$3	$20	$60
$4	$25	$70
$5	$30	$80

More than $80 (specify): _____

CV advantage: can explore contingent/future scenarios, and can measure of total economic value

CV disadvantage: while only one question, it requires careful framing and context must be provided, so is not as simple to answer. It is also difficult to make it generic across multiple sites. Questionable as to whether we can adhere to best practice CV design under the CoastSnap survey & sampling mechanism.

3. Contingent behaviour

Like CV, CB can be predictive and explore how people's values change dependent on contingent scenarios. However, it uses a TCM as the basis, and explores how people's visitation rates might change in relation to hypothetical changes in the quantity or quality of an asset.

If we know how often people visit a beach now, and their willingness to pay per trip (from the TCM), we can then estimate if people will visit more (or less) often due to a predicted change in the future and subsequently estimate the change in economic value under the contingent scenario due to the change in number of trips.

This approach, as for TCM, focusses on use-related recreational values.

It avoids some of the complexities of the CV approach, particularly those surrounding payment mechanism. But, it still requires the contingent scenario to be clearly defined, so it doesn't overcome the need to be specific about the change implied.

In addition to the TCM questions, you would also ask questions such as:

- Q7) Thinking about the next 12 months, how often do you think you will visit this beach?'
    - The same frequency as for the last 12 months
    - A different frequency to the last 12 months. In the coming year, I'll probably visit:
        - Nearly every day (5-7 times a week)
        - A few times a week (2-4 times a week)
        - About once a week
        - About once a fortnight
        - About once a month
        - Less than once a month
        - Not at all

- Q8) The local council is considering building a new carpark. If this facility was made available to you at this beach, compared to the facilities you have available now:
    - It would not change how often I visit
    - It would change how often I visit. If this new facility was available, then in the coming year, I'd probably visit:
        - Nearly every day (5-7 times a week)
        - A few times a week (2-4 times a week)
        - About once a week
        - About once a fortnight
        - About once a month
        - Less than once a month
        - Not at all

CB advantage: can explore contingent/future scenarios in a simpler format than CV.

CB disadvantage: requires more questions to be added (as you need the TCM questions too), and still requires a generic and clear definition of a change that might occur at multiple locations. Limited to measuring recreational use value.

Annex 2 Part A Recruitment Message

PLEASE TELL US ABOUT THE BEACH

YOU PHOTOGRAPHED TODAY

If you are 18 years of age or older, we would like to know **how you use and value** the beach that you photographed today.

To complete the **5-minute survey** visit **– https://tinyurl.com/beachvalue**

If you have completed the survey before, **please do so again.** Your views and uses of the beach may differ each visit – and we would like to capture these differences.

Beaches have an iconic status in Australian culture and play an integral role in our way of life. To **manage these important assets**, a better understanding of how the community use and the value the coast is needed.

The information collected from this anonymous online survey, will be analysed by researchers from the University of Western Australia and will be of great assistance to coastal managers in the Peron Naturaliste Region (from Rockingham to Busselton).

Want to know more:

Email Dr Carmen Elrick-Barr (carmen.elrick-barr@uwa.edu.au) putting the words 'CoastSnap Survey' in the subject line.

The University of Western Australia Human Research Ethics Committee (HREC) has approved this study (HREC number 2021/ET001035)

Annex 2 Part B Survey

Start of Block: Block 13

Real-time monitoring of coastal community values
Thank you for your interest in this survey which examines coastal community social values in the Peron Naturaliste Region (Rockingham to Bunbury). The aim is to collect data on the social value of beaches to support long-term coastal management and planning.

Researchers: Dr Carmen Elrick-Barr, Dr Julian Clifton, Dr Abbie Rogers, Dr Michael Cuttler

What does participation involve: You are asked to complete a 5-minute survey on how you have used the beach today and your views on its condition. At the end, you will have the option to enter a second survey which will gather additional detail on your visit and your perceptions of beach change.

Voluntary Participation and Withdrawal from the Study:
Taking part is voluntary. Your responses will be anonymous and will not be used individually. This means that it will also not be possible to remove your responses from the database should you wish to withdraw them later.

Your privacy: Any information collected will be treated as confidential and all data collected is anonymous. The data will be kept in a password protected computer or a secure server at the University of Western Australia for minimum of seven years.

Possible benefits: The research will benefit the community by providing coastal managers with information on the social value of beaches that can inform management.

Possible risks:
There are no foreseeable risks with this research.

Contacts:
If you would like to participate or discuss any aspect of this study please feel free to contact Dr Carmen Elrick-Barr on: 0422 547 462.

Approval to conduct this research has been provided by the University of Western Australia, in accordance with its ethics review and approval procedures. Any person considering participation in this research project, or agreeing to participate, may raise any questions or issues with the researchers at any time. In addition, any person not satisfied with the response of researchers may raise ethics issues or concerns and may make any complaints about this research project by contacting the Human Ethics Office at the University of Western Australia on (08) 6488 3703 or by emailing to humanethics@uwa.edu.au. All research participants are entitled to retain a copy of any Participant Information Form and/or Participant Consent Form relating to this research project.

Consent:
By continuing with the survey, you agree with the following statement:
"I am 18 years of age or older and I have read the information provided and believe I understand the purpose, extent and possible risks of my involvement in this project. I agree to participate and understand withdrawal is not possible once data is submitted. I understand that all identifiable information is treated as confidential and will not be released in any form that may identify me unless I have consented to this. The only exception is if this information is required by law to be released".

I consent to participate in this research project

- ○ Yes (1)
- ○ No [you will be taken to the end of the survey] (2)

Skip To: End of Survey If Real-time monitoring of coastal community values Thank you for your interest in this survey which... = No [you will be taken to the end of the survey]

End of Block: Block 13

Start of Block: Default Question Block

Welcome

We would like to know how you use and value the beach that you photographed today.

Your views and uses of the beach may differ each visit, and we would like to capture these differences. If you have completed the survey before, please do so again.

- ○ First time user (1)
- ○ Repeat user (2)

End of Block: Default Question Block

Start of Block: Block 8

Display This Question:

If Welcome We would like to know how you use and value the beach that you photographed today. Yo... = Repeat user

When you previously completed the survey you were provided with a user ID. Please enter below.
This will help us explore change in use, perceptions, and values under different beach conditions and over time.

_____

Display This Question:

If Welcome We would like to know how you use and value the beach that you photographed today. Yo... = Repeat user

I can not remember my user ID

○ Yes (1)

End of Block: Block 8

Start of Block: Block 1

Q1. What CoastSnap site are you visiting today?

- ○ Shoalwater Bay, Rockingham (1)
- ○ Henson St, Mandurah (2)
- ○ Heron Point, Murray (3)
- ○ Binningup, Harvey (4)
- ○ Eaton Foreshore, Dardanup (5)
- ○ Koombana Bay, Bunbury (6)
- ○ Dalyellup, Capel (7)
- ○ Busselton Jetty, Busselton (8)
- ○ None / I am not at a CoastSnap site (9)

Q2. Did you upload a CoastSnap photo?

- ○ Yes (1)
- ○ No (2)

Q3. What emotions do you feel when looking at the beach today?
Tick all those that apply.

- ☐ Happy (1)
- ☐ Disgusted (2)
- ☐ Surprised (3)
- ☐ Worried (4)
- ☐ Sad (5)
- ☐ Angry (6)

End of Block: Block 1

Start of Block: Motivation to visit

In the next question, we refer to activities that can take place on the following sections of the coast:

Q4. Please rate the importance of the following to your visit today.

	Not at all important (1)	Slightly important (2)	Moderately important (3)	Very important (4)	Extremely important (5)
Water based Activities (e.g. swimming, surfing, boating) (1)	○	○	○	○	○
Beach and jetty activities (e.g. exercise, 4WD, fishing, surf-life-saving) (2)	○	○	○	○	○
Foreshore based activities (e.g. exercise, socializing, visiting attractions) (3)	○	○	○	○	○
Nature based acivities (e.g. wildlife watching, conservation work) (4)	○	○	○	○	○
The availability of facilities (e..g. cafes, toilets, access paths, playgrounds, attractions) (5)	○	○	○	○	○

Q5. Please rate the following benefits you gained from visiting the beach today.

	Not at all important (1)	Slightly important (2)	Moderately important (3)	Very important (4)	Extremely important (5)	Unsure (6)
Physical health (1)	○	○	○	○	○	○
Mental / emotional health (2)	○	○	○	○	○	○
Spiritual / cultural wellbeing (3)	○	○	○	○	○	○
Social wellbeing (4)	○	○	○	○	○	○

End of Block: Motivation to visit

Start of Block: Beach and Foreshore Conditions

Q6. How would you describe the condition of the following on your visit today? Condition can include safety, cleanliness, and/or visual amenity.

	Very bad (1)	Moderately bad (2)	Neither good nor bad (3)	Moderately good (4)	Very good (5)	Unsure (6)
Ocean condition (e.g. wave condition, rips) (1)	○	○	○	○	○	○
Beach condition (e.g. sandy beach, exposed rocks, beach wrack/seaweed) (2)	○	○	○	○	○	○
Dune condition (e.g. vegetation health and cover) (3)	○	○	○	○	○	○
Foreshore reserve condition (e.g. grassed area) (4)	○	○	○	○	○	○

Q7. How would you describe the condition of these facilities on your visit today?

	Very bad (1)	Moderately bad (2)	Neither good nor bad (3)	Moderately good (4)	Very good (5)	Unsure/Not applicable (6)
Playgrounds (4)	○	○	○	○	○	○
Paths and access to beach and foreshore (3)	○	○	○	○	○	○
Parking (2)	○	○	○	○	○	○
Toilets/Showers (1)	○	○	○	○	○	○
Attractions (e.g. café, shops, tourist sites) (5)	○	○	○	○	○	○
Cultural heritage sites (6)	○	○	○	○	○	○

Q8. Do you have any suggestions for improving this beach and/or foreshore area?

_____

_____

_____

_____

End of Block: Beach and Foreshore Conditions

Start of Block: Block 4

Q9. Did the condition of the beach and/or foreshore stop you from doing any activities you wanted to?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Q9. Did the condition of the beach and/or foreshore stop you from doing any activities you wanted... = Yes

What activities were affected?
Tick all those that apply

- ☐ Water based activities (e.g. swimming, surfing, boating) (1)
- ☐ Beach and jetty activities (e.g. fishing, 4WD, exercise, surf-life-saving) (2)
- ☐ Foreshore based activities (e.g. exercise, visiting attractions, spending time with friends or family) (3)
- ☐ Nature based activities (e.g. wildlife watching, conservation work) (4)

Display This Question:

If Q9. Did the condition of the beach and/or foreshore stop you from doing any activities you wanted... = Yes

Which of the following had the greatest impact on your ability to do the activities you wanted? Tick all those that apply

- ☐ Ocean condition (e.g. wave condition, rips) (1)
- ☐ Beach condition (e.g. sandy beach, exposed rocks, beach wrack/seaweed) (2)
- ☐ Dune condition (e.g. vegetation health and cover) (3)
- ☐ Foreshore reserve condition (e.g. litter) (4)
- ☐ The condition of the facilities (e.g. toilets, showers, playgrounds, cafes) (5)

End of Block: Block 4

Start of Block: Perceptions of beach change

Q10. Erosion is when sand is washed away by the ocean, reducing the beach width. Accretion is when sand builds up, increasing the beach width. In your opinion, is this beach currently:

- ○ Eroding (1)
- ○ Accreting (2)
- ○ Stable (3)
- ○ Unsure (4)

Q11. In your opinion are these changes due to:
Select all those that apply.

- ☐ Daily tides (1)
- ☐ Storms (2)
- ☐ Sea-level rise (3)
- ☐ Coastal development (4)
- ☐ Uncontrolled/inappropriate access (5)
- ☐ Management controls (6)
- ☐ Unsure (7)

End of Block: Perceptions of beach change

Start of Block: About you

Q12. Are you an Australian resident?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Q12. Are you an Australian resident? = Yes

What is your home postcode?

_____

Q13. How often do you visit this beach?

- Daily (1)
- Weekly (2)
- Monthly (3)
- Seasonally (e.g. summer only) (4)
- Rarely (5)
- It depends on conditions (6)
- Occasionally (when you feel like it) (7)

End of Block: About you

Start of Block: Close or additional questions

Thank you for your responses.

Do you have time for a few more questions (approximately 5 minutes)

- ○ Yes (1)
- ○ No, not at the moment (2)

End of Block: Close or additional questions

Start of Block: Block 11

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

Is this your first visit to this beach?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If Is this your first visit to this beach? = No

And Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

When looking at the beach, do you notice any changes since your last visit?

- ○ Yes (1)
- ○ No (2)

Display This Question:

If When looking at the beach, do you notice any changes since your last visit? = Yes

And Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

Please describe the changes you see.

_____

_____

_____

_____

_____

End of Block: Block 11

Start of Block: Block 13

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

How much do you disagree or agree with the following statement.

	Strongly disagree (1)	Disagree (2)	Netural (3)	Agree (4)	Strongly agree (5)	Unsure (6)
I am concerned about the impacts of climate change on coasts generally (1)	○	○	○	○	○	○

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

How aware are you of the general impacts of climate change on coasts, such as sea level rise, coastal erosion, flooding and increasing storminess?

- ○ I am very aware (1)
- ○ I am aware (2)
- ○ I have no or limited awareness (3)
- ○ I do not accept that climate change is occurring (4)

End of Block: Block 13

Start of Block: Block 12

Display This Question:

If Is this your first visit to this beach? = No

And Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

In the last 12 months, how often have you visited this beach?

- ○ Nearly every day (5-7 times a week) (1)
- ○ A few times a week (2-4 times a week) (4)
- ○ About once a week (5)
- ○ About once a fortnight (6)
- ○ About once a month (7)
- ○ Less than once a month (8)

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

How many people usually come with you to this beach?

- ○ Adults (1) _____
- ○ Children (2) _____

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

What is the most common mode of transport you use to get here?

- ○ Walk (1)
- ○ Bicycle (4)
- ○ Motorcycle (5)
- ○ Car (6)
- ○ Bus/ Train (7)
- ○ Other (8) _____

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

Based on this mode of transport, how far do you usually travel to get here and how long does it take?

- ○ Distance (km) (1) _____
- ○ Time (minutes) (2) _____

Display This Question:

If Thank you for your responses. Do you have time for a few more questions (approximately 5 minutes) = Yes

Is this the only place that you stop at on a regular visit here, or do you also stop at other places during the same trip (e.g. visit while going to/from work, school, grocery shopping, or stop at a café, etc)?

- ○ Yes, I usually come straight here and then return home (1)
- ○ No, I usually make other stops before or after I come to this beach (2)

End of Block: Block 12

Start of Block: Block 7

Display This Question:

If Welcome We would like to know how you use and value the beach that you photographed today. Yo... = First time user

Thank you for your participation. Your user ID is:

${e://Field/Random%20ID}

Please keep a record of your user ID for when you next complete this survey. This will help provide information on how use and perceptions change under different conditions and over time.

Display This Question:

If Welcome We would like to know how you use and value the beach that you photographed today. Yo... = First time user

If you would to receive a copy of your user ID via email, please insert an email address below.

_____

End of Block: Block 7

School/Centre/Section | Faculty (or equivalent)
T +61 8 6488 0000 **M** +61 000 000 000 **E** firstname.lastname @uwa.edu.au
M000, Perth WA 6009 Australia
uwa.edu.au

THE UNIVERSITY OF WESTERN AUSTRALIA