A Social Science Index and Conceptual Framework for Assigning Weights in Surf Tourism Planning and Development

A Social Research Methodology Developed in Phuket, Thailand

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A Social Science Index and Conceptual Framework for Assigning Weights in Surf Tourism Planning and Development

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ABSTRACT

This paper develops a social science weighting schema for surf tourism planning and sustainable development, eco-tourism, and conservation studies using surf tourism as a representative worked example. Assessment scores from a previously published surf resource sustainability field study of nine beaches in Phuket, Thailand, were weighted against data taken from surveys of expert scholars and surfers from a range of diverse backgrounds. The study measured levels of significance among weighted and unweighted means and bias ratio for 27 social, economic, environmental and governance indicators. Differences between scores and weighted scores were, in general, low, but this was not the case in key areas of concern, notably governance, and areas where poor governance had negative consequences, such as water quality. The findings indicate that analysis of weighted data helps identify key metrics. We show that analysis of weighted data provides insights not apparent from working on unweighted data. The procedures and weighting strategies employed in this research can be used for tourism planning and other related research activities which use interview data, such as research on, ecotourism, national park surveys, amateur fishing, snorkeling and reef tours. This study provides a conceptual framework for comparisons of different studies using similar protocols.

KEYWORDS

Conservation; Surf Resource Sustainability Index; surf tourism; Thailand; tourism planning; weights

Introduction

Board-surfing and body-surfing sites around the world are under ever-increasing pressures from tourism, coastal development, pollution, and other anthropogenic factors. As the surf tourism industry expands globally, surf breaks are increasingly recognized as both valuable and vulnerable natural resources by surfers and other stakeholders in the literature (Borne & Ponting, 2015, 2017; Buckley, 2002; Butt, 2010; Farmer & Short, 2007; Hales, Ware, & Lazarow, 2017; Lazarow, Miller, & Blackwell, 2007, 2008; Martin & Assenov, 2012, 2014; Martin & O'Brien, 2017; Murphy & Bernal, 2008; Nelsen, Pendleton, & Vaughn, 2007; Ponting, 2014; Short & Farmer, 2012; Ware, Lazarow, & Hales, 2017).

This paper develops a social science weighting schema for tourism planning and development using sustainable surf tourism as a representative worked example. The study investigates the usefulness of weighted analysis and surf resource sustainability indicators

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(Martin, Assenov, & Ritchie, 2014) through properly composed survey. Field research was conducted on surf sites in Phuket, Thailand, and the study is orientated in Southeast Asian and international contexts.

Surf sites and coastal conservation

Strategies to protect surfing resources originally came forward from diverse surfing communities in Australia, New Zealand, and the USA (Martin & Assenov, 2012) followed by rigorous academic studies into sustainability and management (Borne & Ponting, 2015, 2017; Butt, 2011; Ware et al., 2017; Hales et al., 2017; Martin, 2013; Martin & Assenov, 2013, 2014, 2015; O'Brien & Ponting, 2013; Ponting & O'Brien, 2014, 2015; Towner, 2016; Towner & Orams, 2016).

Conservation and sustainable resource management are in effect the sensible and careful use of natural resources by humans whereby individuals are concerned with using natural areas in ways that sustain them for current and future generations of human beings and other forms of life (Miller, 2006). When placing sites in the context of protection or conservation, we must account for a number of sensitivities which may determine the design or structure of the management plan (Barrow, 2005). Surfing sites are no exception. For example, water quality is widely understood as foundational in the health of surf habitats and the surfers who visit them (Butt, 2010, 2011; Martin, 2013; Martin & Assenov, 2012, 2014; Ryan, 2007). Thus, a management plan for a surf site should take into account issues of water quality and any threats to marine resources.

Surf sites are part of a wide and interconnected system of natural processes, including biodiversity on land and in the sea, encompassing numerous stakeholder interests and factors related to the scope of the "whole" surf system as a dynamic model (Martin & O'Brien, 2017). Butt (2010, 2011) suggests that the coast and the waves are undeniably important natural resources and can be used to benefit everyone in a sustainable and stable way. R. Ritchie (in Martin, 2013, p. 31) explains:

> The conservation of surfing sites is much like conserving elephants; it requires the protection of habitat which encompasses not only a large area but also any number of other resources and species … therefore, conservationists who seek the protection of habitat like the idea of protecting surfing areas for this reason.

Surf economics

Economic concerns include the broad scope and relationships among surf resource stakeholders. In contrast with other sport tourism activities in which the economic standing is well-documented, landmark studies by researchers and economists only recently began to investigate the value of surfing and the significance of various surf stakeholder groups in the economy (AEC Group Ltd, 2009; Lazarow et al., 2007, 2008; Murphy & Bernal, 2008; Nelsen et al., 2007; Short & Farmer, 2012).

Martin and Assenov (2012) identified that published research confirming waves as important economic coastal resources—and the stakeholders involved—first appeared in academia through the grey literature, particularly as a result of graduate research and the not-for-profit sector. Peer-reviewed published research soon followed, and by 2007, a new and *progressive period* built on foundational studies of surf tourism research was underway (Martin & Assenov, 2012).

In terms of surf economics, Lazarow et al. (2007, 2008) were at the forefront of the progressive research period, noting that globally, only a handful of studies had investigated the economic impact of recreational surfing in any detail, and therefore the best way to estimate the overall value of the surfing industry was at the human user level through broad approaches such as the estimation of the number of surfers in the world, surfer visitation to sites, or through examining lifeguard data.

While the discussion on market values of surf tourism and surf resources has made considerable progress in recent years, non-market values are increasingly important (Butt, 2010; Martin, 2013). However, the nature and significance of non-market values is ambiguous, particularly when addressing policy implications, and further research in this area is recommended (Scorse & Hodges, 2017).

R. Ritchie (in Martin, 2013, p. 17) notes that on the whole,

> the populace has in the past hopelessly underestimated the value of surfing to coastal communities; Australian communities sometimes discovered that they were dependent on the surf economy after it was too late and sites were destroyed, such as after constructing coastal groynes and dredging estuary openings.

Sustainable surf resource management

Bearing in mind the call for surf site protection and evidence for the value of surfing areas, management and policy development were able to gain traction. Research and policy development, often at the hands of academics who were themselves surfers (Butt, 2011; Lazarow et al., 2007, 2008; Martin, 2013; Martin & Assenov, 2012), spawned a wave of sustainable management literature in recent years. Following suit, universities took interest in the sustainable surf movement, developing research centers and providing programs and associations, thus giving an impetus for the publication of several books dedicated to the subject area.

Among these works, *Sustainable stoke: Transitions to sustainability in the surfing world* (Borne & Ponting, 2015) brought social, economic and environmental arguments and initiatives to light, addressing both international and local concerns. Further heightening the discussion on surf site management and policy development, *Sustainable surfing* (Borne & Ponting, 2017) opened a new dialogue in the area of discerning system boundaries (Martin & O'Brien, 2017), and discussed the importance of surfer-stakeholders in coastal and environmental management processes (Ware et al., 2017; Hales et al., 2017), as well as the advent and role of surf parks in the context of sustainability (Ponting, 2017).

Asia-Pacific case studies

In the case of community-based surf tourism in a developing country, O'Brien and Ponting (2013) explored whether surf tourism can be managed to achieve sustainable host community benefits in a rural village in Papua New Guinea. They identified that sustainable surf resource management, when applied through appropriate policy and practice, could benefit community building and poverty alleviation.

In the Mentawai Islands, Indonesia, surf tourism's most researched region (Martin & Assenov, 2012), where high-quality waves and a burgeoning industry mix with regulation politics, Ponting and O'Brien (2015) suggest a new paradigm in capacity management. Moving beyond the traditional model of solely physical carrying capacity regulation,

they looked at how "low-volume, high-yield" land-based surf tourism development offered a sustainable approach, focusing on social carrying capacity measures and education, including vocational training. In terms of research methods, Towner (2016) suggests that individuals with deep personal experience in the region, are key in identifying sustainable practices. He found that by integrating government policy, rational business practices, and honoring customary laws and local territorial rights, co-management strategies in the Mentawai Islands were showing success.

Other prolific surf tourism destinations in the Asia-Pacific have witnessed changing regulatory policies with various outcomes. In the case of both Fiji and Indonesia, policy and regulation have fluctuated in an effort to address various stakeholder concerns (Ponting & O'Brien, 2014, 2015). For example, in Fiji, where tight regulations were met with mixed opinions, subsequent deregulation also proved to be problematic (Ponting & O'Brien, 2014). However, the deregulation process spawned growing acceptance of the need for regulation by most stakeholders, and this offered a new juncture for participants to seek sustainable alternatives, including policies that address poverty alleviation in destination communities (Ponting & O'Brien, 2014).

Our understanding of surf tourism management problems are increasingly tied to the concept of sustainability. Debates in the literature cluster around the question of surf sites as coastal resources, the economics tied to these resources as it extends to a pool of stakeholders and long-term socio-economic and environmental implications (Martin & O'Brien, 2017). With sustainable surf tourism emerging as a new and dynamic area of tourism planning, identifying new methods of assessment is paramount in further developing the field of study, and this paper proposes two areas of consideration: the use of weighted analysis placed on existing surveys (Martin et al., 2014); and the generation of dialogue on non-prolific surf tourism destinations, such as Phuket, Thailand, or similar locations in the region, such as Cherating, Malaysia.

Phuket, Thailand

In recent years, recreational surfing has gained a notable degree of popularity in Thailand, in terms of participation in the activity and attention in the domestic and international media (Martin, 2013). The tropical resort island of Phuket is the hub of surfing activity in Thailand (see Figure 1), and this is due first to better oceanography, and secondly to unrivaled international access and infrastructure when compared to other surfing locations on the country's west coast (Martin, 2010a, 2010b, 2013). Favorable bathymetry around Phuket (see Figure 1) make the island somewhat of an anomaly along the Andaman Coast (736 km) with quality surf sites. Additionally, the island faces rapidly increasing pressures from coastal development and is therefore an appropriate location for sustainable surf tourism field research (Martin, 2010a, 2010b, 2013).

The Phuket beaches and surf sites used in the study are shown in Figure 1. Phuket is located approximately 8° N, 98°21′ E facing the Andaman Sea. At approximately 550 sq. km, it is Thailand's largest island, extending 48 km in length and up to 21 km in width.

Seasonality in Phuket

The surfing season in Phuket is synchronous with the rain and winds of the Southwest Monsoon from the Andaman Sea (May through October), and therefore surf tourism is

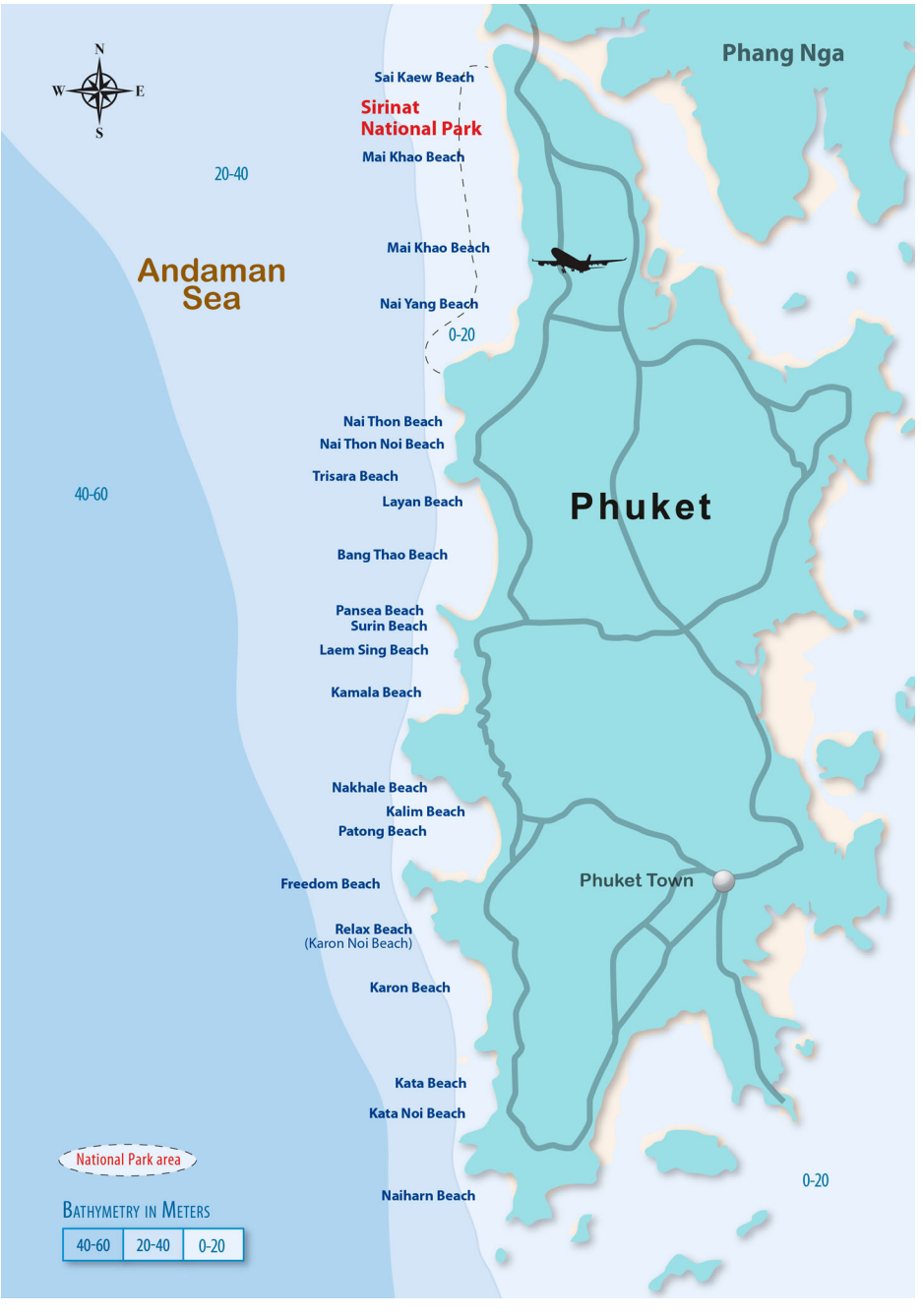

Figure 1. Bathymetry and beaches of Phuket, Thailand. Source: Steven Martin.

a new and welcome market segment serving to address the issues of seasonality as it coincides with the Phuket tourism industry's low season. This is important as it stabilizes annual income. While the surf on the Andaman coast is generated mainly by locally occurring monsoon winds, groundswells from the Indian Ocean intermittently may pass through the Great Channel (between Banda Aceh, Sumatra, and the Great Nicobar

Island) and deliver clean high quality waves at any time of the year. Figure 2 illustrates regional geography and surf meteorology of Phuket, Thailand. Map scale is based on 5° latitude equivalent to 555 km.

Surf tourism in Phuket, Thailand

Surf tourism is particularly important when viewing surfing resources through a socioeconomic lens. However, Thailand's dynamic *Amazing Thailand* tourism advertising campaign

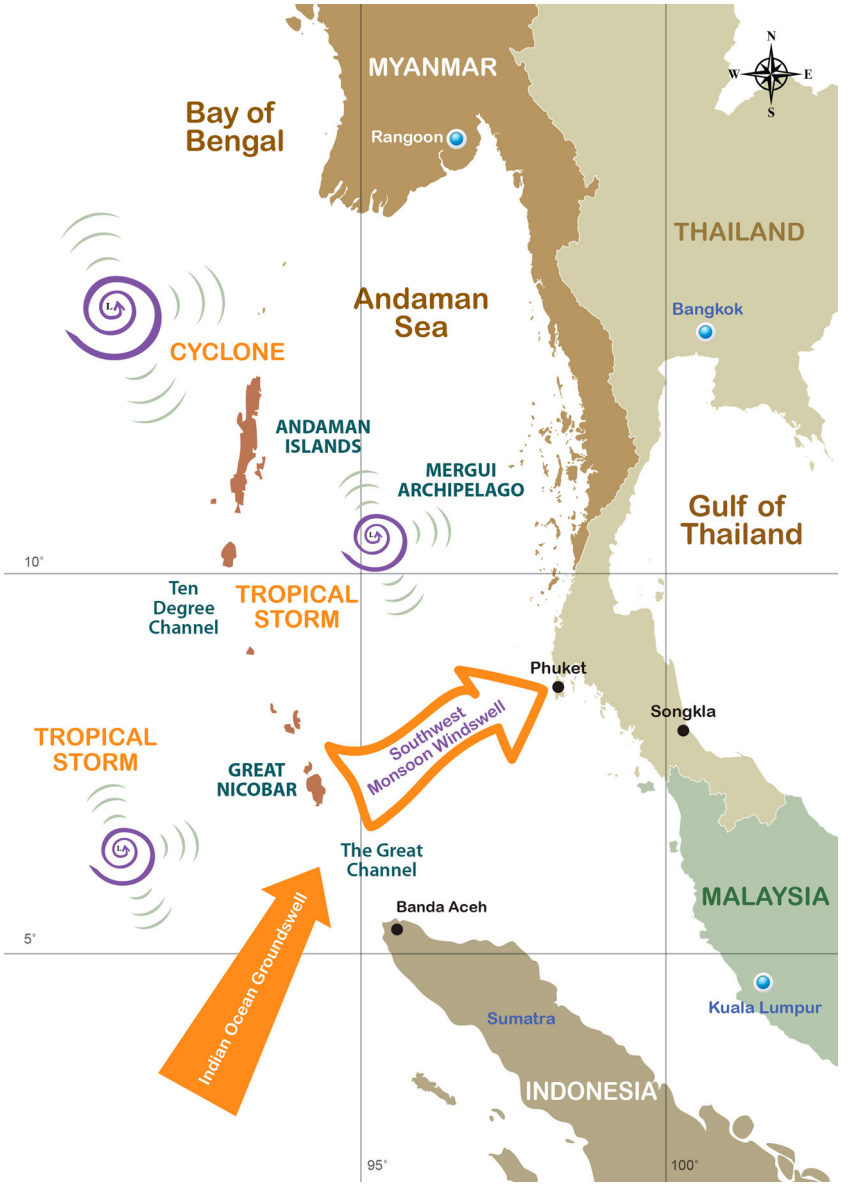

Figure 2. Surf meteorology of Phuket, Thailand. Source: Steven Martin.

Figure 3. Domestic surf tourists, Phuket, Thailand. Source: Steven Martin.

(which promotes tourism in all its forms, including beach, adventure and ecotourism as well as the luxury hotel market and shopping), has continued to overlook surf tourism as a market segment (Martin, 2010a, 2013). At the time of writing, international surfers visit Phuket annually for surfing events, surf travel or to experience surfing in combination with other tourism activities. The new surf tourism market has kindled entrepreneurial spirit among Thais in recent years, as is evidenced by the dramatic increase in board rental enterprises at Phuket surf beaches since 2008 (Martin, 2010a, 2013). For these new surf tourism entrepreneurs, the "low tourist season" became the "surf season", offering new opportunities for economic exploitation of coastal surfing resources. Thus, the development of domestic and international surf tourism, and related social and economic issues, are highly significant to the Phuket tourism industry and to this study (Martin, 2013). Figure 3 shows a new generation of affluent Thai youth taking part in a surf lesson at Kalim Beach during the 2008 Kalim surfing contest.

Methods and approach

This paper aims to investigate the usefulness of weighted analysis of a properly composed survey to identify sustainable tourism management problems (Martin et al., 2014), and to obtain useful management information on surf tourism. Although the field research was conducted in Thailand, the study is further orientated toward employing data in a Southeast Asian and international contexts.

The basis for the research was the development of a social science weighting schema for surf resource sustainability indicators and is an outgrowth of knowledge based on the works by Martin (2013) and Martin and Assenov (2012, 2013, 2014, 2015) who developed the *Surf Resource Sustainability Index* (SRSI). The SRSI is a global model for surf site conservation and employs a conceptual framework for measuring the conservation aptitude at surf sites. Martin (2013) and Martin and Assenov (2014) outlined the original rationale and methodology as follows:

> As a modular approach to surf site field assessment, SRSI provides a set of building blocks which include qualitative and quantitative metrics. The twenty-seven indicators used were based on conservation aptitude and these indicators are integrated into four indices: social, economic, environmental, and governance. Conservation aptitude is defined as a theoretical compass which points toward sustainability […] Conservation aptitude is employed as a relative and qualitative assessment measure of the extent to which a site has in place those attributes considered favorable to its sustainable management as a site and as a natural resource over both the short and long term. (p. 131)

Indicators

A base component of an index is an indicator, a sub-set or pointer which serves as an instrument of measurement. An indicator is a standardized and useful method for measuring and comparing complex data sets (Miller, 2006). A good indicator meets the criteria of being measurable, precise, consistent and sensitive—and measurable entities relate to a specific information need, such as the status of a key ecological attribute, progress toward an objective, or the variation in the level of a given threat over time (The Nature Conservancy, 2007). Thus, indicators are developed in order to measure changes in the environment, similar to the pointer on a pressure gauge, and may also describe effects that either enhance environmental quality and human well-being, or deplete natural resources and lead to a lower quality of life and ecological value of the resource.

Tourism sustainability indicators

Sustainability has emerged as a critical policy focus across the world, and organizations are increasingly required to explain their performance using quantitative metrics (Emerson et al., 2010). Sustainable tourism indicators are tools used to quantify development attributes from the point of view of sustainability and serve as a benchmark against which different sites or destinations can be evaluated (Basu, 2003). Thus, index design is a detailed and lengthy process which requires the development of indicators or pointers which serve to measure and calibrate attributes. Indices are often developed in the context of a need for better policy design whereby highly data-driven information can be processed accurately (Martin, 2013; Martin & Assenov, 2013).

However, tourism sustainability is a complex concept due to its latent, multidimensional and relative nature (Pulido-Fernandez & Sanchez-Rivero, 2009, 2011) and therefore measuring and quantifying it with indicators is intrinsically difficult. As a result, although many attempts have been made to develop sustainability indicators, there is no single set of indicators that can be universally applied to tourism destinations, including surf sites (Martin & Assenov, 2013). Tanguay, Rajaonson, and Therrien's (2011) response to the complexity and multiple interpretations of sustainable tourism is the initial selection of an extended list of 500 potential sustainable tourism indicators, from which, they extract a priority shortlist of 20 operational indicators. They recognize that indicators are likely to evolve over time, and there is a need to review them periodically. The most important attributes of indicators are defined as credibility, pertinence and value.

Surf Resource Sustainability Index

To address concerns over sustainability in planning and development of surf tourism resources, particularly in reference to the conservation of coastal surfing sites, Martin (2013) and Martin and Assenov (2012, 2013, 2014, 2015) developed and tested SRSI indicators.

Multi-dimensional framework

The multi-dimensional SRSI framework offers the benefit of description and referencing of conceptual and analytical values in two layers, qualitative and quantitative. The qualitative component of the index consists of field observations and descriptions, and serves to increase reliability and validity of fieldwork. Subsequently, the qualitative component places a numerical value to the qualitative field assessment based on a 1–5 *Likert Scale* (i.e. 1 = very low; 2 = low; 3 = moderate; 4 = high; and 5 = very high), such that high ratings represent high aptitude for conservation (Martin & Assenov, 2014), as described above.

Complete background information on the criteria and implications of indicators are not provided in this paper, but are available from Martin and Assenov (2013, 2014, 2015). For clarity, an abridged and revised outline of surf resource sustainability indicators has been provided in Table 1. Indicators are listed alphabetically within each index.

Qualitative indicator assessment chart—Nai Yang Beach (Center Reef) governance index

As SRSI qualitative assessment tables normally comprise several pages of text per site, this paper provides only a sample of field data gathered for the governance index of Nai Yang Beach (Center Reef). Table 2 offers an example from Martin and Assenov (2013) of the descriptive assessment and rating outcomes for the governance index, and is intended to show the qualitative component of SRSI. Judgments were ultimately made by the researchers and took into account data gained from prior knowledge, participant observation, interviews, and repeat visits to each site.

Quantitative indicator assessment chart applied at nine beaches in Phuket, Thailand

Based on Martin and Assenov (2015), the complete SRSI assessment chart for nine beaches in Phuket, Thailand, is provided in Table 2. Beaches are listed in order of their location from north to south, and the assessed values for each indicator at individual beaches are provided. Mean values based on equal weights are calculated for each beach within a given index. Mean values are also provided for each indicator (across the nine beaches) in order to gauge individual beach indicators relative to the island's averages.

Importance ratings

Based on the existing SRSI indicators (Martin, 2013; Martin & Assenov, 2013), 21 in-depth interviews were conducted in order to determine the relative importance of each indicator. Interviewees were selected from surf tourism scholars, surf industry professionals, veteran

Table 1. Abridged and revised outline of surf resource sustainability indicators.

Social indicators

1. Clubs—Boardriders: Number of private and public clubs or organizations who access and use each site, including the number of members and activities undertaken.
2. Clubs—Lifesavers: Number of private and public lifesaving organizations and considered the number of members, types of services provided, and educational activities for youth or the community.
3. History: Number of years that each surf site has been surfed and assessed the usage, popularity, number and types of surfing activities occurring over time.
4. Public safety: Presence of crime, such as vehicle safety, theft, violence, or local gangs, including the past record and present account of public safety at each site.
5. Social experience: Societal conditions surrounding the surfing experience at each site, including local ethics and knowledge.
6. Socio-psychological carrying capacity: Number of surfers each site can accommodate in terms of crowdedness, including the size of the surfing area and type of wave.
7. Surf community: Number of surfers in the community and identified the surfing community-supported activities at each site.
8. Surf events: Number and size of contests per year at each site, including the number and types of participants (amateurs and professionals) and the positive and negative social implications.

Economic indicators

9. Surf amenity and infrastructure: Presence of beneficial amenities at each site, including parking areas, walkways, showers and bathrooms.
10. Surf events: Key stakeholders' economic interests and relationship with each site, including the short-term and long-term economic contributions.
11. Surf industry and commercial activity: "Economic hub" at each site relative to the number of surf shops and surf-related businesses.
12. Surf-related nonmarket values: Economic significance of the site in terms of social, cultural, existence, vicarious and other nonmarket values; took into account the host community along with local and tourist surfing populations.
13. Surf tourism: Number of domestic and international tourists who interact with each site, and the economic impacts related to the surf tourism experience, including hotels available to surf tourists, surf lessons and surfboard rentals.

Environmental indicators

14. Biodiversity: Overall health and vitality of the natural environment, including the condition of the coral reef and the presence of marine life at each site.
15. Coastal engineering: Significance and effects on the environment of coastal engineering projects or structures and documented physical changes to each site (note: negative effects received lower scores).
16. Eco-physical carrying capacity: Number of surfers or visitors that each site can accommodate before negative environmental consequences are likely to occur.
17. Hazards—Marine life: Known or reported presence of aquatic life or marine predators which may pose hazards to site users, including jellyfish, sea urchins, sharks, stonefish, etc. (note: lower hazards received higher scores).
18. Hazards—Physical: Presence of dangerous ocean currents and the presence of near shore and submerged rocks and reefs at each site (note: lower hazards received higher scores).
19. Quality—Beach: Overall aesthetic condition of each site, including cleanliness, presence of beach litter, urbanization, encroachment, erosion or other aspects of degradation.
20. Quality—Water: Point and non-point sources of pollution as well as turbidity, nutrient loading, and the presence of marine debris and plastics in the water at each site.
21. Surf type and quality: Local wave types and average wave frequency during the year or season; considered various skill levels of stakeholders who use each site.

Governance indicators

22. Beach and water safety: Availability and number of lifeguards as well as lifeguard towers and facilities, including proximity to hospital, in conjunction with the seasonality of services at each site.
23. Education and interpretation: Types, number and visibility of signage and interpretation at sites alongside any community meetings, workshops, research or advocacy for site integrity.
24. Legislative status: Type or level of governance at each site (i.e. conservation status), including entities or branches of local, state or federal government with jurisdiction.
25. Management: Existence of guidelines or standards for activities at each site alongside the effectiveness of enforcement.
26. Not-for-profit organizations: Presence and activity of not-for-profit organizations or other authority at each site.
27. Public access: Level of accessibility alongside laws or other issues surrounding public right of entry, such as hotels or infrastructure which inhibit or prohibit entry at particular sites.

Source: Adapted from Martin and Assenov (2014).

Table 2. Adapted and revised Nai Yang Beach (Center Reef) SRSI Governance Index.

Indicator	Site assessment detail	Assessed value
(#22) Beach and water safety	Presence of national park staff in nearby offices. As with other sites in Phuket, the presence of lifeguards is unpredictable, mainly due to unstable and seasonal employment contracts. Drowning is rare due to minimal nearshore currents (high surf episodes notwithstanding) and the gradually sloping shore and shallow seafloor.	2.5
(#23) Education and interpretation	Limited printed materials are available at park headquarters, however no information is present at the surf site. Occasional local campaigns by various hotels and organization to educate youth on environmental issues which can include organized beach clean ups. Very little signage exists.	2.5
(#24) Legislative status	National Park (NP) and Marine Protected Area (MPA) designation. No motorized tourist craft allowed, such as jet ski or boats for parasail. Fishers and *longtail* boats may enter and moor in the area.	4
(#25) Management	No immediate issues of mixed use area (surf zone is occasionally shared with kite-surfers). Recycling containers are in place and maintained. Interviewees note that key concerns include the effectiveness of Marine Protected Area (MPA) management and enforcement, particularly regarding issues surrounding fishers and pollution discharge from *longtail* boats. Interviewees pinpoint the gap between legislation and management.	2.5
(#26) Not-for-profit organizations	Presence of several not-for-profit organizations which occasionally organize events at the site which work toward improving environmental management and awareness among hoteliers and the local community (e.g. *SEEK—Society, Environment, Economy, and Knowledge*). Some progresses have been made such as the placement of trash bins labeled with recycling symbols.	3.5
(#27) Public access	Appropriate public access and parking. Easy access to the beach given the absence of hotels and other infrastructure. Interviewees note that park entrance gate keepers may ask non-Thai visitors for cash.	4
Mean	***High***	***3.17***

Source: Martin and Assenov (2013).

lifeguards, and professional and international surfers and surf tourists from Africa, Asia, Australia, Europe, and California and Hawaii, USA. Data were collected, analyzed subsequently published in Tourism Planning and Development (Martin & Assenov, 2014).

The quantitative portion of this data provided levels of importance attributable to interviewees in the survey. The measurement scale was based on a 1–5 number *Likert Scale* such that high values reflected a high importance for conservation planning and development. Interviewees were asked to choose one of five potential values (i.e. 1 = very low; 2 = low; 3 = moderate; 4 = high; and 5 = very high). Thus, the mean indicator values fell into the following five categories: very low (1.00–1.80); low (1.81–2.60); moderate (2.61–3.40); high (3.41–4.20); and very high (4.21–5.00). Mean indicator importance values are employed as "weights" in the current study. See Figure 4 SRSI Indicator Importance Bar Chart.

Weighting

When applying stakeholder importance ratings, two approaches are normally taken, one using equal weights for indicators within a given index and the other using weights based on the judgment of a particular group of stakeholders (Martin & Assenov, 2014), such as the data applied in this study. Assessed indicator values can then be can then be adjusted or "weighted" on their relative value based on research into their importance, as in the judgments of experts or a particular stakeholder group (Phillips & House, 2009). It

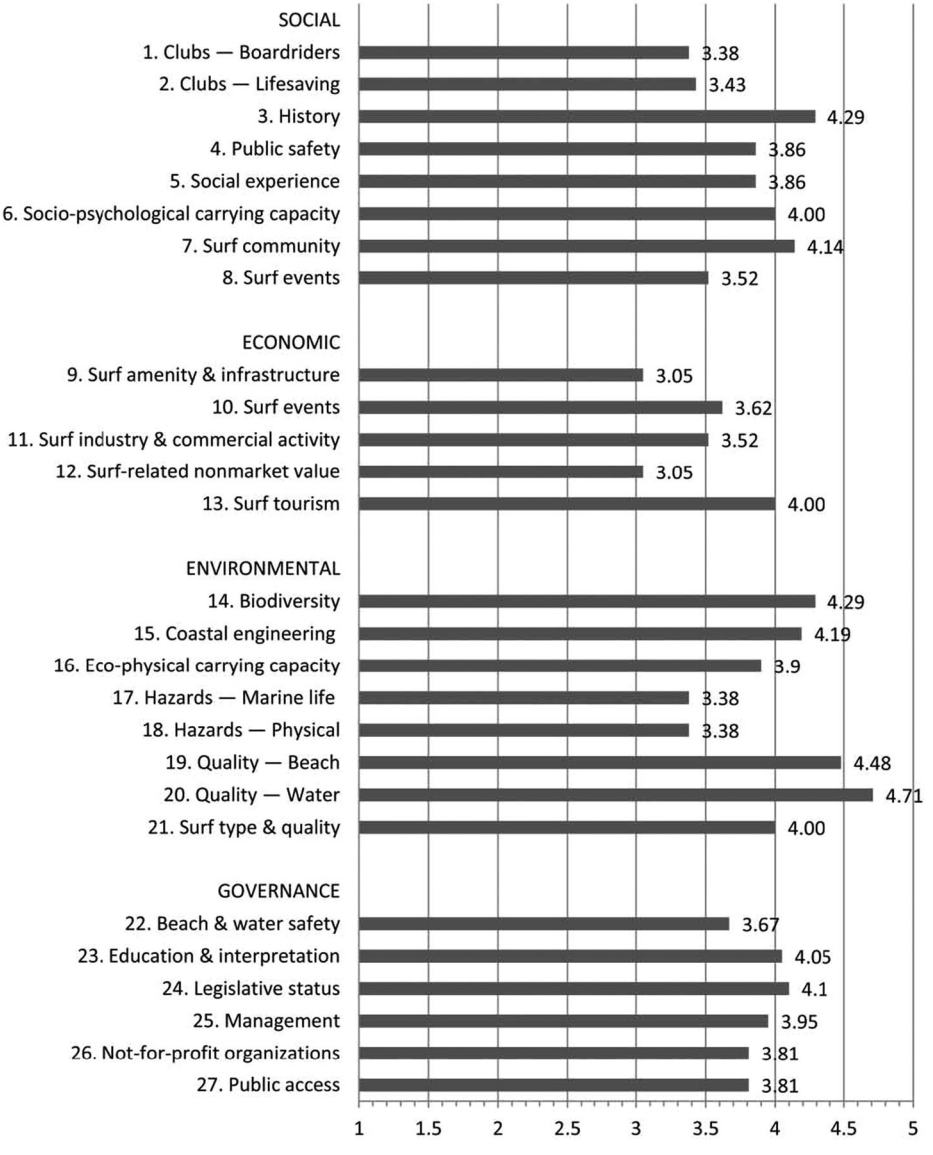

Figure 4. SRSI indicator importance. Source: Martin and Assenov (2014).

Note: 1–5 Number Likert Scale: very low (1.00–1.80); low (1.81–2.60); moderate (2.61–3.40); high (3.41–4.20); and very high (4.21–5.00).

should be noted that different tourism stakeholders may attribute different importance to the beach quality indicators, and weightings may vary depending on their individual concerns (Phillips & House, 2009).

The methodology outlined below utilizes assessment scores from the previously conducted SRSI field study of nine beaches in Phuket, Thailand, as provided in Table 3 (Martin, 2013; Martin & Assenov, 2015), weighted against their apparent importance based on surveys by Martin (2013) and Martin and Assenov (2014) (Figure 4) conducted with expert scholars and surfers from diverse backgrounds.

Weight schema development

The currently published SRSI design employs equal weights among indicators (Martin, 2013; Martin & Assenov, 2013, 2014, 2015). The following discussion serves as an introduction of a more sophisticated—yet straightforward—weighting system and employs primary field data collected at Phuket surf sites by Martin (2013) and Martin and Assenov (2015). The required primary indicator value for standard geometric weighting was generated as the average of expert survey results based on a diverse group of internationally experienced surfers and scholars (see Figure 4) and offers a global scale estimate of the criteria for SRSI indicator importance (Martin, 2013; Martin & Assenov, 2014).

Care was also taken in the choice of experts used as a basis for the weights system. In light of the conclusions drawn by Towner and Orams (2016) expert opinions need to be sought from informants as close to the tourist/environment interface as possible. The level of cooperation of the interviewees was judged to be very high. The weighting scheme is important to try to balance the relative importance of questions in a survey, and the approach used in our studies is potentially relevant to other studies of nature-oriented tourism.

Arithmetic and geometric means

Weight structure can reflect the intrinsic value of indicators and be justified procedurally. Consequently, setting indicator weights is a decisive component of measurement design with potential to impact index values and rankings, and weight systems normally involve a complex theoretical process aimed at assessing relative importance (Martin, 2013).

Two approaches to the weighting were employed. Firstly, a standard arithmetic mean was calculated. An arithmetic mean using equal weights can be used when each indicator or dimension is judged to be approximately equal in value (i.e. equal weights). Due to an absence of comprehensive data to the contrary, an arithmetic mean was a logical point of departure. Secondly, a geometric mean was calculated by combining indicator importance with surf site assessment data, thus placing a weight based on the judgment of the expert surveys as suggested by Martin (2013).

Geometric mean is achieved by multiplying indicator importance data with site assessment data for each indicator, and subsequently taking the square root of the combined data as follows in Equation (1):

$$X_w = \sqrt{X \times w_x}, \tag{1}$$

where X = value of site assessment (raw site score).

w_x = indicator importance for site assessment X, used as a weight, X_w is the calculated weighted score for site assessment X.

Paired *t*-tests and bias ratio

The effects of weighting were analyzed using two approaches: the paired *t*-test and the bias ratio (B/S) test as described by Kish (1992) which was tested using the *t*-distribution. These two statistics ask different statistical questions. The paired *t*-test on scores and weighted scores within each category, such as social, economic, environmental and

Table 3. SRSI Phuket quantitative assessment chart.

	Nai Yang Reef	Nai Yang Island	Surin Beach	Kamala Beach	Kalim Beach	Karon Beach	Kata Yai Beach	Kata Noi Beach	Nai Harn Beach	***Mean***
Social Index (SocSRSI)										
(1) Clubs—boardriders	1.5	1.5	1.5	2.5	1	2.5	3	1	1	***1.72***
(2) Clubs—lifesavers	1	1	2	1.5	1	1	1	1	1	***1.17***
(3) History	2	2	3	3	3	2	4.5	3	3	***2.83***
(4) Public safety	4	4	3.5	3	4	4	4	2	4	***3.61***
(5) Social experience	5	4.5	4	3	3.5	4	4	3	3.5	***3.83***
(6) Socio-psychological carrying capacity	2	4	3.5	4	4	4	4.5	3	3	***3.56***
(7) Surf community	2	2	4	3	3	3	4.5	3	3	***3.06***
(8) Surf events	1	1	2	2.5	3	2	4	1	2.5	***2.11***
Mean	***2.31***	***2.5***	***2.94***	***2.81***	***2.81***	***2.81***	***3.69***	***2.13***	***2.63***	***2.74***
Economic Index (EconSRSI)										
(9) Surf amenity and infrastructure	3	2	3.5	2.5	2.5	3	4	2	2	***2.72***
(10) Surf events	1	1	2	2.5	3	2	4	1	1	***1.94***
(11) Surf industry and commercial activity	2	2	3.5	2.5	2	2	4	1.5	2	***2.39***
(12) Surf-related nonmarket values	3	3	4	3.5	3.5	3.5	4.5	2.5	4	***3.50***
(13) Surf tourism	1	2	4	3	2.5	3.5	5	3	3	***3.00***
Mean	***2***	***2***	***3.4***	***2.8***	***2.7***	***2.8***	***4.3***	***2***	***2.4***	***2.71***
Environmental Index (EnvSRSI)										
(14) Biodiversity	4	3.5	2	2	1	2	2	2	2.5	***2.33***
(15) Coastal engineering	4	4	3	3	2	3	3	2	3	***3.00***
(16) Eco-physical carrying capacity	2	4	4	4	3	4	4	4	4	***3.67***
(17) Hazards—marine life (*reverse scale*)	3.5	3.5	4	4	4	4	4	4	4	***3.89***
(18) Hazards—physical (*reverse scale*)	3	3	2.5	3	3	3	3	3	2.5	***2.89***
(19) Quality—beach	3.5	3	3	3	2.5	3.5	3	3.5	4	***3.22***
(20) Quality—water	4.5	3.5	3.5	3	2	3	2.5	4	4	***3.33***
(21) Surf type and quality	4	4	3.5	3	4	3	4	4	4	***3.72***
Mean	***3.56***	***3.56***	***3.19***	***3.13***	***2.69***	***3.19***	***3.19***	***3.31***	***3.5***	***3.26***
Governance Index (GovSRSI)										
(22) Beach and water safety	2.5	1	2.5	2	1.5	2.5	2.5	2	2	***2.06***
(23) Education and interpretation	2.5	1	2	2	1	2	2	1.5	2	***1.78***
(24) Legislative status	4	4	1	1	1	1	1	1	1	***1.67***
(25) Management	2.5	2	1	1	1	1	1	1	1	***1.28***
(26) Not-for-profit organizations	3.5	1.5	1.5	2.5	1	1	1	1	1	***1.56***
(27) Public access	4	3	3.5	2.5	3	3	3	2	3.5	***3.06***
Mean	***3.17***	***2.08***	***1.92***	***1.83***	***1.42***	***1.75***	***1.75***	***1.42***	***1.75***	***1.90***
Composite Index Mean	***2.76***	***2.54***	***2.86***	***2.64***	***2.40***	***2.64***	***3.23***	***2.21***	***2.57***	***2.65***

Source: Adapted from Martin (2013) and Martin and Assenov (2015).

governance, is testing the null hypothesis (H_0) that weighting has no significant effect upon the rating of the scores. The B/S test is testing whether the weighting has a significant effect upon the means of the overall scores within each broad category.

Results

Social, economic, environmental and governance terms used here refer to the SRSI indicators as outlined in Tables 1–3 and Figure 4.

Analyzing paired *t*-tests and bias ratio

Based on the abovementioned methodology (i.e. the paired *t*-test and the bias ratio test), the weighted and unweighted SRSI values were not in general greatly different. For example, the rankings at Phuket beaches for environment issues are quite similar for most criteria (refer to Tables 4–7).

This was not the case in governance issues where unweighted sums are frequently much lower than the weighted sums, indicating that there is a general lack of adequate governance of surf-related resources in Phuket. Paired *t*-tests on the governance issues comparing weighted and unweighted scores were consistently different at very high levels of significance ($p \leq .01$ and even higher significance levels).

Based on the original field assessments of Phuket surf sites, which identified low scores for the governance index, including the key indicators for education, legislation and management, identifies that Phuket surf beaches are in less than sustainable situation, and this may also be a sign that the future trend is less than favorable unless these and other indicators are adequately addressed (Martin & Assenov, 2015), and these data were further emphasized through the use of weighted scores.

Tables 4–7 show that the two Nai Yang beaches (Nai Yang 1 and 2) stand out as different to the other seven beaches. Both these beaches are in the Surinat Marine National Park, Thailand. The *Kish* statistic shows that in general the overall means of unweighted and weighted scores for most categories on most beaches are either not significant ($p > .05$) or only significant at the $p \leq .05$ level. The exception is governance ($p < .01$). Scores and weighted scores are very significantly different on all beaches except Nai Yang 1 (see Table 2) which is near the ranger station of the national park. The paired *t*-test is a much more focused analysis of each survey indicator. The paired *t*-tests show clearly that there are governance problems on most of the beaches, and this is consistent with the conclusions drawn from the B/S analysis.

To a considerable extent, social issues criteria overlap with governance criteria. For example, two beaches (Kamala and Kata Noi) score very badly for both social quality and governance.

In most cases, the equally weighted scores were lower than the weighted scores: Kata Yai had a very high economic score, considerably higher than the weighted score indicating facilities were better than the global expectations as indicated by the priority weightings. The nearby Kata Noi shared the typically lower raw score than weighted score found in the present study and was not well rated ($p \leq .01$).

Perhaps the most important category for encouraging or discouraging surfing activities and surf tourism is the environmental conditions category (see Figure 4). Surf tourists are concerned about surfing in dirty water (given that this is the highest ranked indicator in the index) and hence this should be a heavily weighted consideration, and such issues will tend to override other considerations.

Weights of all the environmental parameters are uniformly high to very high, and so differences in unweighted and weighted scores are very sensitive to small differences. Significant differences do appear in the case of the overall assessment of the different beaches. For example, the B/S index indicates problems with the perception of the quality of environment at Karon and Kamala beaches ($p \leq .01$) even though such discrepancies are less apparent based on the paired *t*-test on each separate environmental

Table 4. SRSI weight schema for social indicators.

Indicator		weight	Nai	Yang 1	Nai	Yang 2	Surin		Kamala		Kalim		Karon		Kata Yai		Kata Noi		NaiHarn	
			Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}
Social	Clubs—boardriders	3.38	1.50	2.25	1.50	2.25	1.50	2.25	2.50	2.91	1.00	1.84	2.50	2.91	3.00	3.18	1.00	1.84	1.00	1.84
	Clubs—lifesaving	3.43	1.00	1.85	1.00	1.85	2.00	2.62	1.50	2.27	1.00	1.85	1.00	1.85	1.00	1.85	1.00	1.85	1.00	1.85
	History	4.29	2.00	2.93	2.00	2.93	3.00	3.59	3.00	3.59	3.00	3.59	2.00	2.93	4.50	4.39	3.00	3.59	3.00	3.59
	Public safety	3.86	4.00	3.93	4.00	3.93	3.50	3.68	3.00	3.40	4.00	3.93	4.00	3.93	4.00	3.93	2.00	2.78	4.00	3.93
	Social experience	3.86	5.00	4.39	4.50	4.17	4.00	3.93	3.00	3.40	3.50	3.68	4.00	3.93	4.00	3.93	3.00	3.40	3.50	3.68
	Socio-psychological capacity	4.00	2.00	2.83	4.00	4.00	3.50	3.74	4.00	4.00	4.00	4.00	4.00	4.00	4.50	4.24	3.00	3.46	3.00	3.46
	Surf community	4.14	2.00	2.88	2.00	2.88	4.00	4.07	3.00	3.52	3.00	3.52	3.00	3.52	4.50	4.32	3.00	3.52	3.00	3.52
	Surf events	3.52	1.00	1.88	1.00	1.88	2.00	2.65	2.50	2.97	3.00	3.25	2.00	2.65	4.00	3.75	1.00	1.88	2.50	2.97
	SocSRSI equally weighted	*3.81*	*2.31*		*2.50*		*2.94*		*2.81*		*2.81*		*2.81*		*3.69*		*2.13*		*2.63*	
	SocSRSI weighted		*2.87*		*2.99*		*3.32*		*3.26*		*3.21*		*3.22*		*3.70*		*2.79*		*3.10*	
	Bias ratio (prob. p*, significance)*		*0.0177**		*0.0307**		*0.0176**		*0.0015***		*0.0332**		*0.0247**		*0.9355, ns*		*0.00104***		*0.010***	
	Paired t*-test*		*0.0288**		*0.0344**		*0.0107**		*0.0007****		*0.0171**		*0.0268**		*0.9258, ns*		*0.00002****		*0.0033***	

Source: Adapted and revised from Martin (2013).

Notes: *Score*^{w} is a weighted score (see Equation (1)). Levels of significance: ns = not significant at $p > .05$ level, *significant at $.05 \geq p > .01$, **significant at $.01 \geq p > .001$, ***very significant at $p \leq .001$.

Table 5. SRSI weight schema for economic indicators.

Indicator		weight	Nai	Yang 1	Nai	Yang 2	Surin		Kamala		Kalim		Karon		Kata Yai		Kata Noi		NaiHarn	
			Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}
Economic	Surf amenity and infrastructure	3.05	3.00	3.02	2.00	2.47	3.50	3.27	2.50	2.76	2.50	2.76	3.00	3.02	4.00	3.49	2.00	2.47	2.00	2.47
	Surf events	3.62	1.00	1.90	1.00	1.90	2.00	2.69	2.50	3.01	3.00	3.30	2.00	2.69	4.00	3.81	1.00	1.90	1.00	1.90
	Surf industry and commercial activity	3.52	2.00	2.65	2.00	2.65	3.50	3.51	2.50	2.97	2.00	2.65	2.00	2.65	4.00	3.75	1.50	2.30	2.00	2.65
	Surf-related nonmarket impacts	3.05	3.00	3.02	3.00	3.02	4.00	3.49	3.50	3.27	3.50	3.27	3.50	3.27	4.50	3.70	2.50	2.76	4.00	3.49
	Surf tourism	4.00	1.00	2.00	2.00	2.83	4.00	4.00	3.00	3.46	2.50	3.16	3.50	3.74	5.00	4.47	3.00	3.46	3.00	3.46
	EconSRSI equally weighted	*3.45*	*2.00*		*2.00*		*3.40*		*2.80*		*2.70*		*2.80*		*4.30*		*2.00*		*2.40*	
	EconSRSI weighted		*2.52*		*2.58*		*3.39*		*3.09*		*3.03*		*3.08*		*3.85*		*2.58*		*2.80*	
	Bias ratio (prob. p*, significance)*		*0.0597, ns*		*0.0152**		*0.964, ns*		*0.0305**		*0.0452**		*0.143, ns*		*0.0071***		*0.0215**		*0.157, ns*	
	Paired t*-test*		*0.0684, ns*		*0.0213**		*0.970, ns*		*0.101, ns*		*0.116, ns*		*0.198, ns*		*0.137**		*0.0080***		*0.1733, ns*	

Source: Adapted and revised from Martin (2013).
Notes: *Score*^{w} is a weighted score (see Equation (1)). Levels of significance as for Table 4.

Table 6. SRSI weight schema for environmental indicators.

Indicator		weight	Nai	Yang 1	Nai	Yang 2	Surin		Kamala		Kalim		Karon		Kata	Yai	Kata	Noi	NaiHarn	
			Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}
Environment	Biodiversity	4.29	4.00	4.14	3.50	3.87	2.00	2.93	2.00	2.93	1.00	2.07	2.00	2.93	2.00	2.93	2.00	2.93	2.50	3.27
	Coastal engineering	4.19	4.00	4.09	4.00	4.09	3.00	3.55	3.00	3.55	2.00	2.89	3.00	3.55	3.00	3.55	2.00	2.89	3.00	3.55
	Eco-physical carrying capacity	3.90	2.00	2.79	4.00	3.95	4.00	3.95	4.00	3.95	3.00	3.42	4.00	3.95	4.00	3.95	4.00	3.95	4.00	3.95
	Hazards—marine life	3.38	3.50	3.44	3.50	3.44	4.00	3.68	4.00	3.68	4.00	3.68	4.00	3.68	4.00	3.68	4.00	3.68	4.00	3.68
	Hazards—physical	3.38	3.00	3.18	3.00	3.18	2.50	2.91	3.00	3.18	3.00	3.18	3.00	3.18	3.00	3.18	3.00	3.18	2.50	2.91
	Quality—beach	4.48	3.50	3.96	3.00	3.67	3.00	3.67	3.00	3.67	2.50	3.35	3.50	3.96	3.00	3.67	3.50	3.96	4.00	4.23
	Quality—water	4.71	4.50	4.60	3.50	4.06	3.50	4.06	3.00	3.76	2.00	3.07	3.00	3.76	2.50	3.43	4.00	4.34	4.00	4.34
	Surf type and quality	4.00	4.00	4.00	4.00	4.00	3.50	3.74	3.00	3.46	4.00	4.00	3.00	3.46	4.00	4.00	4.00	4.00	4.00	4.00
	EnvSRSI equally weighted	*4.04*	*3.56*		*3.56*		*3.19*		*3.13*		*2.69*		*3.19*		*3.19*		*3.31*		*3.50*	
	EnvSRSI weighted		*3.78*		*3.78*		*3.56*		*3.52*		*3.21*		*3.56*		*3.55*		*3.62*		*3.74*	
	Bias ratio (prob. p*, significance)*		*0.0627, ns*		*0.0333**		*0.0138**		*0.0030***		*0.0227**		*0.0043***		*0.0313**		*0.0114**		*0.1156, ns*	
	Paired t*-test*		*0.0669, ns*		*0.0620, ns*		*0.0352**		*0.0340**		*0.0271**		*0.0391**		*0.0686, ns*		*0.0947, ns*		*0.0955, ns*	

Source: Adapted and revised from Martin (2013).
Notes: *Score*^{w} is a weighted score (see Equation (1)), Levels of Significance as for Table 4

Table 7. SRSI weight schema for governance indicators.

	Indicator	weight	Nai Yang 1		Nai Yang 2		Surin		Kamala		Kalim		Karon		Kata	Yai	Kata	Noi	NaiHarn	
			Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}	Score	*Score*^{w}
Governance	Beach and water safety	3.67	2.50	3.03	1.00	1.92	2.50	3.03	2.00	2.71	1.50	2.35	2.50	3.03	2.50	3.03	2.00	2.71	2.00	2.71
	Education and interpretation	4.05	2.50	3.18	1.00	2.01	2.00	2.85	2.00	2.85	1.00	2.01	2.00	2.85	2.00	2.85	1.50	2.46	2.00	2.85
	Legislative status	4.10	4.00	4.05	4.00	4.05	1.00	2.02	1.00	2.02	1.00	2.02	1.00	2.02	1.00	2.02	1.00	2.02	1.00	2.02
	Management	3.95	2.50	3.14	2.00	2.81	1.00	1.99	1.00	1.99	1.00	1.99	1.00	1.99	1.00	1.99	1.00	1.99	1.00	1.99
	Not-for-profit organizations	3.81	3.50	3.65	1.50	2.39	1.50	2.39	2.50	3.09	1.00	1.95	1.00	1.95	1.00	1.95	1.00	1.95	1.00	1.95
	Public access	3.81	4.00	3.90	3.00	3.38	3.50	3.65	2.50	3.09	3.00	3.38	3.00	3.38	3.00	3.38	2.00	2.76	3.50	3.65
	GovSRSI equally weighted	*3.90*	*3.17*		*2.08*		*1.92*		*1.83*		*1.42*		*1.75*		*1.75*		*1.42*		*1.75*	
	GovSRSI weighted		*3.49*		*2.76*		*2.65*		*2.62*		*2.28*		*2.54*		*2.54*		*2.32*		*2.53*	
	bias ratio (prob. p*, significance)*		*0.0481**		*0.0196**		*0.006***		*0.001****		*0.0013***		*0.003***		*0.003***		*0.0001****		*0.0052***	
	Paired t*-test*		*0.0613, ns*		*0.0071***		*0.003***		*0.0002****		*0.0003****		*0.0008****		*0.0008****		*0.00001****		*0.0021***	
SRSI equally weighted mean ± SE			*2.81 ± 0.231*		*2.63 ± 0.230*		*2.87 ± 0.193*		*2.69 ± 0.152*		*2.44 ± 0.211*		*2.69 ± 0.195*		*3.22 ± 0.241*		*2.30 ± 0.209*		*2.65 ± 0.221*	
SRSI weighted mean ± SE			*3.21 ± 0.158*		*3.10 ± 0.160*		*3.26 ± 0.126*		*3.16 ± 0.103*		*2.97 ± 0.140*		*3.14 ± 0.130*		*3.42 ± 0.148*		*2.89 ± 0.152*		*3.11 ± 0.156*	

Source: Adapted and revised from Martin (2013).
Notes: *Score*^{w} is a weighted score (see Equation (1)), Levels of Significance as for Table 4.

issue ($p \leq .05$). The environmental scores for the two beaches in the Surinart National Marine Park (Nai Yang 1 and 2) are the highest on environmental criteria of any beach in Phuket and weighting of the scores has no significant effect because all the weights are high and the scores are high.

This study has focused on the opinions of surfing experts that were almost entirely western in outlook. This however, is likely to change as the surf industry expands in scope, and this process is already well under way in Thailand, Malaysia and Indonesia (Buckley, 2002; Martin, 2013). Knowledge of the impact of government and developmental works on surf tourism amongst government Thai administrators has not been properly investigated, although they are sensitive to the political pressure arising from such examples as beach pollution from stormwater and sewage overflows and blackwater effluent from degraded beach lagoons (Martin, 2013).

Implications

Given that the currently applied weights were similar in value to site assessment scores, the results are not fundamentally dissimilar and a greater variance in weights could prove to show that there is more room for evaluation and discussion. While the current presentation of data uses the cases of Martin and Assenov (2014, 2015), it provides general documentation and represents a conceptual framework for the use of weights in developing sustainability research. Inevitably, any judgment of preference is a subjective judgment regarding the relative importance of one impact category over another, and value judgments may change with location or time, or the demographic of the people involved; thus the underlying standard is that the weighting procedure needs to be clearly documented, and the unweighted data should be shown together with the weighted results to ensure a clear understanding of the assigned weights (Scientific Applications International Corporation, 2006).

It is assumed that if other experts were surveyed who focused on different priorities or disciplines, it is likely that results could vary, such as there being critical emphasis on environmental indicators from environmentalists, or social or economic emphasis by social scientists. For example, Phillips and House (2009) recognize that different stakeholders attribute different importance to the beach quality indicators they investigate, and three distinct groups of stakeholders, namely surfers, mothers and conservation workers, assign weightings that vary significantly in line with their priorities, which, respectively, tend to emphasize different physical, human, and biological factors. As the current study is the first to address weighting of conservation indicators specifically of surf sites, research and scholarly work in the field is limited.

When applying weights to indicators and indices, research designs fundamentally employ some weighting algorithm chosen by the researchers (Emerson et al., 2010; Esty, Levy, Srebotnjak, & Sherbinin, 2005), such as the usage of arithmetic and geometric means applied in this study. The research presented in this paper employed a psychometric 1–5 *Likert Scale* (Likert, 1932) for indicator importance data and field assessment data alike, and this original choice in metrics was not altered or normalized given that the raw data are on the same scale. However, other choices of metrics are available and future research design can consider other approaches to making data representative (Emerson et al., 2010; Esty et al., 2005).

In terms of the generation of data, if weights are updated with each analysis, this creates complications when comparing the SRSI across time, considering that weights are subject to change over time and that experts and stakeholders may change their minds. Conversely, if the weights are not updated, then challenges emerge in indicator reliability and applicability with time. For example, the profile of people being surveyed might also change, such as the case of Russian tourism in Phuket having shown both dramatic increases and declines in recent years. The national origin and hence cultural attitudes of surfers in Phuket would be expected to change over time and in ways which are not entirely predictable.

If weights are updated with each survey, this may create challenges in comparing an index across time, as weights are subject to change as data changes over time. Conversely, if the weights are not updated, this creates challenges in defending their use in a different time period. Shifts in weights are also indicative of changes in priorities and cultural origins of tourists. Weights may also be justified or influenced by the urgency or perceived priority for political intervention in a particular indicator, such as a site where an imminent coastal engineering project is planned. Perhaps changes in weighting in itself would indicate changes in perception over time and provide interesting insights into the evolution of the field of study.

We must also consider that weights developed using statistical relationship tools (e.g. *SPSS* and *Prima*) also require judgments in order to design the particular application. Therefore, applying statistical tools may require judgments in order to design the particular application and may significantly affect the weighting process and outcome.

Conclusion

Planners' perceptions of what concerns tourists might not correspond with those of the tourist consumer, and *vice versa*, and it may be important to recognize perception clashes in future research, such as discussed in Ponting and O'Brien (2014, 2015) in the wake of changing regulations in Fiji and Indonesia. In either case, governance is a critical issue in the paradigm of a freedom-orientated recreational activity such as surfing, and this discussion is highly evident in the most up-to-date peer-reviewed literature, including Borne and Ponting (2015, 2017), Ware et al. (2017), Hales et al. (2017), Martin and O'Brien (2017), Ponting and O'Brien (2014, 2015), and Towner (2016). Similarly, results of the present study have shown governance issues are statistically highly significant ($p < .01$) (see Tables 4–7) to clean water, access, beach conditions and other management issues critical for making a site attractive for land-based surf tourist access, such as in Phuket, Thailand.

The current research identifies that governance issues are statistically significant for planning and development information in Thailand. In contrast to the casual attitude to surf tourism during the twentieth century, when valuable surfing sites that were also of importance in preservation of habitat were carelessly lost through lack of insight by planning authorities (Lazarow et al., 2007, 2008; Martin & Assenov, 2012; Murphy & Bernal, 2008; Nelsen et al., 2007; Short & Farmer, 2012), current peer-reviewed research indicates that governance and appropriate management of coastal surfing resources are of high importance to sustainability and management (Borne & Ponting, 2015, 2017; Ware et al., 2017; Hales et al., 2017; Martin & Assenov, 2013, 2014, 2015; O'Brien & Ponting, 2013; Ponting & O'Brien, 2014, 2015; Towner, 2016; Towner & Orams, 2016). In Thailand, a

spin-off of the expansion of the fisheries and aquaculture industries has been the increased availability of marine science expertise. Similarly, the current expansion of the surfing industry in Malaysia and Thailand (Martin, 2011, 2013), may increase expertise on sustainable surf tourism.

For example, hospitality and tourism education programs in Thailand could benefit from a greater emphasis on environmental tourism, including sustainable surf tourism (Martin, 2010a, 2013). Considering that hospitality and tourism faculties have considerable expertise in using surveys to identify marketing opportunities and problems in tourism, it would be interesting to survey differences between international surfers to local Thai surfers and stakeholders, interviewed by Thai researchers. This would require interviewers with strong knowledge of sustainable surf tourism practices and the Thai language. Outcomes could include administrators who are better informed about key issues, and so weighting could have an important effect on prioritizing sustainable surf tourism policy in Thailand.

In a Southeast Asian context, Phuket is a much more generalized tourist destination than surfing sites in Indonesia (Buckley, 2002; Martin, 2010b, 2013; Ponting & O'Brien, 2015; Towner, 2016; Towner & Orams, 2016) and Papua-New Guinea (O'Brien & Ponting, 2013). Most surf tourists come to Phuket for general tourism along with surfing (Martin, 2010b, 2013) and so its market value might not be immediately apparent to those involved in tourism (Scorse & Hodges, 2017; Lazarow et al., 2007, 2008). The importance of surf resource sustainability indicators might not be apparent to those focused on other aspects of tourism, yet beach environments unattractive or unsafe to surfers more or less become unappealing to other beach users sooner or later (Martin, 2010b; Martin, 2013; Martin & Assenov, 2013, 2014, 2015; Hales et al., 2017). Generating and employing weighted data in sustainable surf tourism research in Thailand and other countries may provide unforeseen benefits to the industry and field of study.

Benefits of weighted data

The study measured levels of significance among weighted and unweighted means and bias ratio for 27 social, economic, environmental and governance indicators relevant to the surf tourism industry. Future analysis of trends in weighting may provide information on the evolution of the subject of study, such as changes in the origins of surf tourist and their cultural priorities.

The procedures and weighting strategies could be used for other areas of study employing interview data, for example, ecotourism, national park surveys, amateur fishing, and charter boat operations, such as coral reef snorkeling tours and whale watching. Priorities need to be identified and appropriate weights used accordingly.

This paper has shown that analysis of weighted data provides insights not apparent from working on unweighted data. We hope that the use of weighted data in sustainable surf tourism research will generate future dialogue in this developing area of study—especially where expert judgment on surf resource sustainability indicators can be brought into the conversation quantitatively by using this framework.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Scope	Tourism Planning and Development (TPD) aims to explore and advance our theoretical and practical understandings of the intersections between tourism, planning and development studies. Each of these fields of study is characterised by rich scholarly and interdisciplinary traditions. TPD seeks to leverage these and other complementary scholarly traditions to build new interdisciplinary understandings in tourism planing and development. In a rapidly changing and uncertain world, tourism planning and development processed are being shaped by globalisation, public, private and third sector management and governance. In some cases, communities, societies, governments, and non-government organisations. In doing so, the Journal seeks to engage and challenge readers by asking What can/should we do about tourism planning and development? Who can/should be taking responsibility for tourism planning and development? Research investigating the nature, characteristics, processes, impacts and effects of tourism planning and development in the 21st century is welcome. Research exploring the key uncertainties between politics, society, culture and the environment, or scrutinising the shifting configurations of tourism and its social and economic logics are also particularly welcome. Contributions to TPD may deal with locations at various stages of social, cultural and economics development, and be directed at exploring international, national, regional, or local scales. They may examine local and transnational mobilities and/or development processes, and may critically engage with developing-developed-emerging economies' dichotomies.

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