

## 2 Surf resource system boundaries

*Steven Andrew Martin and Danny O'Brien*

A 'system boundary' is a theoretical concept in environmental science representing the intersecting and interrelated human and physical elements in the natural world at a given site. This chapter develops a system boundary discussion on surf sites, recognizing 'surf system boundaries' (Figure 2.1) as more than the beach and sea; they encompass numerous stakeholder interests and factors related to the scope of the 'whole' surf system as a sustainable and dynamic model. The following discussion serves to review and broaden the knowledge of surf system boundaries and provide clarity in two sets of dimensions: the physical boundaries of surf sites and the resource stakeholders.

### Physical dimensions

Over the last 30 years, it has increasingly been recognized that mankind's economies and even survival are challenged by the realities of ecological and



*Figure 2.1* Surf system boundaries include physical areas and resource stakeholders.

economic interdependence – and nowhere is this more true than in shared ecosystems and in ‘the global commons’, such as the oceans and in particular shorelines. The UN report *Our Common Future* (United Nations, 1987) emphasizes that the oceans cover over 70 per cent of the planet’s surface and provide the balance in the Earth’s wheel of life: ‘They play a critical role in maintaining its life-support systems, in moderating its climate, and in sustaining animals and plants, including minute, oxygen-producing phytoplankton ... they provide protein, transportation, energy, employment, recreation, and other economic, social, and cultural activities’ (1987: 179).

Thus, the oceans are marked by a fundamental unity from which there is no escape, where interconnected cycles of energy, climate, marine living resources, and human activities move through coastal waters (United Nations, 1987). Coastal areas, such as beaches, along with the accompanying dunes and shoreline environments, were established after stabilization of sea level less than 7,000 years ago and are part of an interconnected single natural system (GOP, 2013). Surf sites are dynamic features of the littoral, comprised of a particular set of geographic features and phenomena that unite the physical system in such a way that waves form and break in a manner that is conducive to surfing. They include the surf zone (the area where waves break as they approach the shore) as well as the areas affected by local tides and local flora and fauna and are part of a wider natural system (GOP, 2013). The physical dimensions of sites include the sea and the waves, the beach and sand bars, the reefs and biodiversity, the adjacent terrestrial environment and a number of physical processes.

Research accounting for the wider natural surf system has only recently appeared in the literature, particularly in reports by the not-for-profit sector (Martin and Assenov, 2012). Increasingly, the physical dimensions of surf sites, including geomorphic and bathymetric features, are being recognized as baseline to the integrity of sites (Bicudo and Horta, 2009; Scarfe *et al.*, 2009; Surfrider Foundation, 2016a). Accordingly, the physical boundaries of surf sites encompass more than the littoral, and their integrity is linked to and dependent on adjacent terrestrial areas and open sea. For example, surf sites include those at river mouths where changes in sediment outflow can alter morphology of the area; thus what happens inland can directly affect the sites. The natural watershed of San Mateo Creek, California, is a highly publicized example, where a naturally-occurring outflow of cobblestones geologically creates several world-class surf sites, collectively known as Trestles, and organizations such as the Surfrider Foundation are protesting the development of a toll road which will alter the outflow of the watershed (Surfrider Foundation, 2016b; Sustainable Surf, 2016; Nelsen *et al.*, 2007). Sites are also sensitive to changes, and features that can slow or obstruct ocean swells from traveling to a given coast. Offshore developments, such as artificial reefs, wind farms and Wave Energy Converters (WECs) can block or slow waves from reaching sites (Butt, 2010). In consideration of these examples, surf site boundaries can be extended well beyond the immediate area to include the wider terrestrial and ocean natural systems, and this concept can be extended further to include the winds and weather systems that produce

the waves. Consequently, surf site integrity is intrinsically tied to the implications of climate change and sea level rise.

### ***Surfing habitat***

Surf sites are part of a wide and encompassing system of natural processes. Sustainable Surf (2016) defines *surfing habitat* to include waves, oceans, marine animals (fish, seals, whales, sea birds), coral reefs, rocky reefs, ecosystem flora and fauna (plankton, kelp), and watersheds on land.

Direct human impacts on surfing habitat include threats identified to have a multiplier effect on the environment, such as over-fishing, urban pollution (sewage, urban runoff, industrial discharge), sedimentation, marine debris, coastal development, oil spills, watershed land-use change (Sustainable Surf, 2016). In the face of these issues, Buckley (2002) proposes that surf sites, depending on how commercial surf tourism is managed, are jointly vulnerable to major environmental impacts and hold the potential to help with the conservation of native habitats and traditional cultures.

### ***Surf habitat conservation***

Conservation is 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). As the concept of coastal conservation often includes stakeholder use and community involvement with the ultimate aim of maintaining environmental integrity, significant to the implementation of conservation ideals is the proactive management and use of various coastal planning approaches (Kay and Alder, 2005), and these actions are most effective when accounting for the environmental capital of a given area. Thus, 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). Biologist R. Ritchie 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.

(in Martin, 2013: 31)

The recognition of surfing areas as a coastal resource worthy of protection is a relatively recent development sparked in part by the prolific growth of domestic and international surf travel which has spread surf tourism to cities and rural areas around the world. Surf tourism has awakened coastal communities and local and regional governments to the significance and consequences associated

with the loss or degradation of the resource. Only recently has research validated the habitat importance of surf sites when conducting Environmental Impact Assessments in coastal projects (Butt, 2010; Scarfe *et al.*, 2009). Butt (2010) identifies a number of ways in which waves can be adversely affected or lost, including the construction of solid structures (which are common and permanent), dredging river mouths and canals, chemical pollution and sewage, oil spills, nuclear waste, and litter and marine debris, in addition to problems with access. 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 and Assenov, 2012, 2014; Ryan, 2007). In terms of conservation ecology, Ritchie (in Martin, 2013: 33) suggests:

We must consider that surfers require clean water and beaches, and water quality is a serious issue – if you get sick surfing an area you will likely not come back – nobody wants to surf or vacation at a polluted area.

Research in conservation action planning includes a great number of considerations and approaches in order to address human impacts and other issues affecting the resource base, including rapid assessment strategies (TNC, 2007), and surf site research is no exception. In order to segment research data, indices can be employed to identify assessable qualities or attributes that contribute to conservation for any given surf location. By categorizing sets of indicators to form social, economic, environmental, and governance indices, data can be applied quickly to distinguish key issues at threatened sites. For example, the Surf Resource Sustainability Index (SRSI) (Martin, 2013; Martin and Assenov, 2013, 2014, 2015) employs a multidimensional approach by placing sustainability indicators into qualitative and quantitative modules for analysis, serving as a theoretical compass pointing at surf habitat conservation issues.

### *The demarcation of surf sites*

A contemporary and conceptual recognition of surf sites first arose without the consideration of the physical boundary or demarcation of the surfing area per se; rather plaques and statues were displayed at sites to recognize local cultural icons or to encourage tourism, such as in Freshwater Beach (Australia), Pipeline and Waikiki (Hawai'i, USA), Santa Cruz (California, USA), and Uluwatu (Bali, Indonesia) (Farmer and Short, 2007). While all these sites are clearly acknowledged to have a strong association with surfing, none had formal mechanisms in place capable of protecting or enhancing the site for surfing. For this to occur, as well as visual recognition, a reserve system can be employed to identify and protect iconic surfing sites (Farmer and Short, 2007).

Some of the earliest demarcations of surf sites were in ancient Hawai'i, where sociopolitical management systems emphasized the significance, use, and physical boundaries of sites. As revealed in an interview with K. Koholokai (Martin, 2013: 34), stories and legends of the Hawaiian surf sites lend credit to the

contemporary concept of the surfing reserve. The native Hawaiians have been surfing these sites for many centuries:

Ancient surfing sites like *Ku'emanu Heiau* adjacent to Kahalu'u Beach Park [Kona, Hawai'i] and *Hale'a'ama Heiau* at Kamoia Point [Kona, Hawai'i] (today called the 'Lyman Point break') were afforded a type of protection according to traditional Hawaiian culture. Since ancient *He'e Nalu* (Hawaiian surfing) was a religious expression especially for the Ali'i or chiefly clans, it required surfing protocols of *Pule* (prayers), *Oli* (chants), *Ho'okupu* (offering), and *Kapu kai* (ceremonial sea bath). Surf sites like *Ku'emanu* and *Hale'a'ama Heiau* were several of the many physical and spiritual sites set aside for *He'e Nalu* (surfing). There were *ili* (strips of land) within an *Ahupua'a* (land division units) that was divided into smaller parcels of land like *Mala'ai* (plantation or gardens) and even *ili Kupono* or *ili Ku* (reserved chief lands) and *ili lele* (small parcels of land here and there). Kamoia Point is an *ili Ku* land division unit set aside for surfing and other sports activities, so *ili Ku* was not subject to tax or tribute by a *Konohiki* (landlord) of the *Ahupua'a*.

Although the contemporary lifestyle, sport and industry behind surfers and surfing have spread worldwide, Short and Farmer (2012) note that surf breaks are the very core of this activity and have 'largely been taken for granted.' They point to surf tourist destinations where the expanding surfing sector has done little to prevent the loss or contamination of sites: for example, the adjacent environment has not been protected from inappropriate development. Key issues include surf sites being overwhelmed by development, population pressures, and the associated shadowing, pollution, sewerage, stormwater (Short and Farmer, 2012), and beach erosion because of the cutoff of the supply of sand (AECOM, 2010).

Farmer and Short (2007) note that surf sites have physical and social dimensions which include the beach and adjacent surf zone. They note that surf sites include not only the physical features of the marine and coastal zone which intrinsically enhance aspects of the surfing experience; they may include structures such as surf clubs. Social attributes include the surf site history or places considered sacred by surfers for a particular reason (Martin and Assenov, 2014).

### ***Surfing reserves***

While the conservation of coastal areas has a long history in many regions around the world, the protection and management of surf sites is a relatively recent phenomenon. The surfing reserve concept opens a new dialogue for the theoretical, practical, and political applications of surf site recognition and conservation. The first ever surfing reserve was formed in 1973 at Bells Beach, Victoria, Australia and serves as a milestone in surf conservation history. The original legislation was land-based, essentially protecting only the foreshore and terrestrial park area (FFLA, 2010).

Coastal conservation favours human use and interaction as integral to the sustainability of a given area and many coastal zones are set aside as parks and reserves intended to serve as habitat for wildlife, provide space for recreation and tourism, access to fishing grounds, or other purposes aimed at the conservation of natural resources. Broadhurst (2001) points out that parks and reserves have different meanings in different circumstances, the former suggesting some return of benefit to the user, the latter being concerned more with conserving the potential to provide a return for future generations. However, Kay and Alder (2005) suggest that the ability of conservation areas to meet the multiple-use demands of coastal users while providing for conservation is questioned by environmental preservationists who seek multiple-use as only a trade-off between economic development and preservation.

Broadhurst (2001: 145) asks, 'If we designate a place as special, does that mean that other places are not special?' In theory, the conservation of special places exists only in the human mind, as an abstract concept aimed at changing people's behaviour or the side effects of their behaviour. In practice, for conservation to work, people must first agree to have a conservation area, and what rules to apply, and the stakeholders must understand what to do or what not to do in the context of a wider and variable chain of events (Anthoni, 2001). Thus, while one particular area may be resistant to various human or natural impacts that cause environmental change, another area may be highly susceptible, and the designations of environmental zones need to be site-specific and take into account a wide range of criteria (Broadhurst, 2001). Concerning vulnerable and biodiverse marine environments, Jessen *et al.* (2011) identify that sustaining ocean health requires ecosystem-based approaches to management and that Marine Protected Areas (MPAs) are a central tool in this context. In a broad sense, MPAs include areas of the coastal zone or ocean conferred a level of protection for the purpose of managing use of resources and ocean space, or protecting vulnerable or threatened habitats or species (Dimmock, 2007).

The most comprehensive strategy to date for the direct protection of surf sites is the concept of the 'surfing reserve' (Farmer and Short, 2007; Short and Farmer, 2012), including representational announcements by the local community. The promulgation or 'symbolic declaration' of surfing reserves is imperative in recognizing surfing activities as vital to a particular area, including the socioeconomic and cultural value of surfing, wherein the surfing community is interested in developing a long-term management plan in conjunction with the local land management authority (Lazarow, 2010).

A surfing reserve is designed to formally recognize surfing sites and in doing so provide a focus for the ongoing protection of those sites and to assist in the concerned management and development of the adjacent land area; it is a proactive step towards surf site conservation and represents a mechanism to redress the 'casual attitude' of surfers to their surf breaks (Short and Farmer, 2012). Justification for surf break protection through a reservation system can take into account an ever-increasing and mobile surfing population, unrelenting environmental and development pressures in the coastal zone, and the 'less than impres-

sive record of mass tourist development and destruction that has followed on from surf break discoveries in many third world locations' (Lazarow, 2010: 265).

Short and Farmer (2012) note that surfing reserve boundaries vary considerably from one site to another, ranging in size from just a few hundred metres of coast to several kilometres. Sites should extend from the shoreline at least 500 to 1,000 metres out to sea to make sure the breaks themselves are included. They provide examples in Australia where the reserves include the surf breaks, the coast, and the surrounding ocean, and range in extent from 600 metres of coast and 50 hectares in size to over seven kilometres of coast and 400 hectares. While surfing reserves may not have any direct bearing on adjacent land use, they may provide a substantial support in the debate about adjacent land use and development (Short and Farmer, 2012).

## **Stakeholder dimensions**

### *Economic Linkages*

Understanding the broad scope and relationships among surf resource stakeholders is a relatively new endeavour. Researchers and economists have only recently begun to investigate the value of waves and identify the significance of various stakeholder groups. Most evident are the individual surfers who bring money to local businesses and the wider coastal economy when they go surfing (for example, making local purchases of provisions and petrol). While surfers are an obvious stakeholder group, their capacity goes beyond riding the waves and includes their employment in various businesses and surf-related industries intrinsically tied to a particular coastal area. Butt (2010) identifies that surf resource stakeholders include surfers and other members of the community who own or work in surf-related establishments where the visitors spend their money, including surf shops, surfboard manufacturers or surfing schools. Similarly, there are businesses that may derive income based on the existence of a good surfing wave in their town through extrinsic and less obvious sources, such as airlines, rental car companies, petrol stations, restaurants and bars, etc. For instance, the AEC Group (2009) found that surf businesses on the Gold Coast, Australia created local employment for a number of high-skill occupations tangentially connected to the resource, including graphic designers, filmmakers, journalists, web designers, legal and finance professionals, as well as the more obviously related areas of surfboard shaping, clothing and hardware design, surf schools, educators, and surf media. Although non-surfers, such as hotel employees, managers, shop owners, politicians, or anybody else with a relationship to the site, may not have a direct stake in riding the waves, they can have indirect stakes, including employment in service industries, and other social and economic interests (Butt, 2010).

Another dimension of stakeholders in surf sites are interests connected with surfing events. O'Brien (2007) notes that impacts on host communities and

linkages among stakeholders include contest sponsors, surf shops, hotels, advertisers, banks, stores, restaurants, and bars, resulting in short and long-term benefits and enhanced business relationships. He notes that key sectors include surfing hardware, surf accessories and services, hospitality accommodation, and event-related infrastructure. Additionally, in order to set up and run the event, local suppliers provide infrastructure, such as scaffolding, tents, public address systems, trophies, prizes, and T-shirts, as well as services, such as 'qualified judging, travel, accommodation and hospitality solutions, media and photographic services, and entertainment venues for event augmentations' (O'Brien, 2007: 152).

### ***Stakeholders and surf system sustainability***

Martin and Assenov's (2012) review of surf tourism research suggests a need to define the complete system boundaries of surf sites, including the significance and activities of new regional and demographic markets, surfwear manufacturers and the sponsorship of surf events, cultural shifts in the surfing subcultures, and the impacts of technology and coastal engineering innovations such as artificial surfing reefs. While these topics are of growing interest in the academic community, published research attesting to the physical and human 'surf system' as a holistic spectrum of social, economic, and environmental criteria and implications for sustainability is limited. To address these concepts, sustainable surf site policy and management must attend to various local ecosystems as a range of complex, diverse yet integrated components with essential linkages spanning people, places, and impacts on a vulnerable resource base consisting not only of the water, waves, reefs, and coastal morphology, but also of the coastal users as stakeholders, local infrastructure, and economy (Martin, 2013).

The argument that waves are resources, and that a wide range of stakeholders are players in their sustainability, has only recently appeared in academia, particularly as a result of graduate research and the not-for-profit sector (Martin and Assenov, 2012). For example, Butt (2010) (in a report commissioned by Surfers Against Sewage) suggests that the world's coasts and waves are indeed natural resources and can be used to benefit everyone in a sustainable and stable way. He notes that the wider consequences of degrading or destroying surf breaks are not well understood and may seem inconsequential, but the implications should be taken seriously: 'We don't know where the threshold is; we don't know how much we can modify the system before it goes out of balance' (Butt, 2010: 45).

In the wide view, natural resources are a component in 'natural capital', which includes the services with which nature provides us and other species, such as those that sustain life and support our livelihoods and economies (Miller, 2006). It is in this context that Surfing Capital (Lazarow *et al.*, 2007, 2008) brings the argument of natural capital into the context of surfing through itemizing the natural and human impacts relative to wave quality and frequency along with environmental and experiential dynamics. Under the framework of Surfing



Capital, Lazarow *et al.* (2007, 2008) draw a list of direct stakeholders that includes biologists, climate change specialists, coastal developers, engineers and managers, environmentalists, legislators and politicians, social scientists, a wide range of amenity stakeholders in the built and natural environment, and various stakeholders in issues of public access and safety covering both public and private property. Thus, the sustainability of the integral surf system relies on the ability of diverse stakeholders to engage in dialogue and education covering such issues as the elucidation of surf sites as emergent and dynamic coastal resources. These sites are increasingly being recognized as natural capital, the sustainability of which can only be achieved by their wise and careful management. Miller (2006: 8) places the concept of managing natural capital in the context of one's own economic integrity: 'Protect your capital and live off the income it provides. Deplete, waste, or squander your capital, and you will move from a sustainable to an unsustainable lifestyle.'

### ***Surfers as resource stakeholders***

Surfing is an important recreational and cultural use of the coastal zone and surfers are an important coastal stakeholder group; they have strong cultural passion and sense of ownership of their surf spots as 'natural cultural resources' ASBPA (2011). Counter to the stereotype of surfers as unemployed beach bums, experienced surfers often have college degrees and are mostly in the upper middle-class income bracket (Nelsen *et al.*, 2007). However, surfers constitute a coastal interest group that has historically been ignored in coastal management (Scarfe *et al.*, 2009). Butt (2010) writes extensively on the role of the surfers as a significant stakeholder group directly affected by the integrity of surf site sustainability. He notes that if a surf site is destroyed, polluted, or degraded for some reason, the surfers in the town will not only suffer because they will be unable to surf it, but they might also suffer because their jobs depend on that wave bringing money-spending tourists into town. For example, a sudden loss of revenue occurred to the community at Mundaka, Spain, where a coastal dredging project degraded a world-class wave (Murphy & Bernal, 2008).

The role of surfers is essential when considering the identification, preservation, or mitigation of surfing resources in coastal planning and project development (ASBPA, 2011). Accordingly, by engaging surfers, ideas or concerns can be addressed early in the coastal management process. Scarfe *et al.* (2009) suggest that as the social, economic, and environmental benefits of surfing breaks are realized, surfers are increasingly integral players in coastal resource management. For example, surfers can pinpoint areas of special interest that developers should avoid and they have a role to play in promoting the following basic principles: conserving and enhancing natural and cultural heritage, sustainable use of natural resources, understanding and enjoyment of the environment through recreation, and the sustainable social and economic development of local communities (Butt, 2010). Surfers are also core stakeholders in the case of urban sites which they identify as their local breaks and at sites where good

wave quality attracts locals and travelling surfers alike, including world-renowned iconic breaks (Short and Farmer, 2012). In terms of education and public awareness, surfers suggest that knowledge empowers the public through promoting relevant issues (Martin, 2013; Martin and Assenov, 2014), and studies by Lazarow (2010) suggest that in the long run, educating the surfing community and public on the importance of sites and their protection is crucial to surf site protection. The need for public awareness is being met by the rise of grassroots surf organizations, which have increased significantly in recent years.

### ***Grassroots surf organizations***

ASBPA (2011) highlights the fact that surfers are becoming increasingly organized as stakeholder groups in protecting existing surf spots and supporting coastal management policies that take into consideration social, economic, and environmental implications. At the local, regional, and national not-for-profit level, some well-known examples include Save the Waves Coalition, SurfAid, Surfers Against Sewage, Surfrider Foundation, Surfers Environmental Alliance, Waves for Development, and Wildcoast.

Surfers may also form local and regional boardriders and lifesaving clubs. These organizations are usually based at or centred on surf sites, and form independent stakeholder groups. Augustin (1998) notes that these clubs can unite to form national federations, and play a vital role in the promotion of surfing. They may also help to inspire synergies among surfing sponsors, the media, surfers, and local communities. Surf lifesaving clubs may form independently or under the auspices of local or regional governments, and can become grassroots stakeholder groups directly related to site integrity in terms of community, education, and safety (AECOM, 2010). The public standing of lifesaving clubs is very high and they usually have good access to local and state government (Martin and Assenov, 2014).

### ***Surf tourism stakeholders***

In terms of surf tourism, Buckley (2002) offers four interconnected groups of stakeholders which influence the role of surf tourism in sustainable development. They include individual surfers, the commercial and competitive tour operators, local residents, and government officials. He notes that the ethics among surfers form a complex fabric of stakeholder responsibility along with the desires and codes among tour operators, the traditional and modern perspectives of host communities, and the requirements of governments.

Bearing in mind the global surf tourism industry, surf resource sustainability is of growing significance to a wide range of stakeholders in very different socio-economic and cultural settings (Martin and Assenov, 2012). The most obvious differentiation is between urban 'surf city' economies in the developed world, for example the bustling Gold Coast, Australia, or San Sebastian, Spain, and rural island settings in developing countries, such as the Mentawai Archipelago,

Indonesia, and Lobitos, Peru. In the case of the former, Surf Cities are coastal communities where surfing plays an instrumental role in the character and fabric of the community and tourism industry. The World Surf Cities Network (2016) defines a Surf City as an urban area where surfing, surf culture and employment in surf industries are relevant to the economic, social and cultural base of the city and the surf industry is formally recognized by the city government. Tangible elements include not only physical location, population, natural resources, and the manufacturing industry, but also services and culture. Services comprise those relevant to surf tourism, surf retail, surf schools, surfing events and competitions, surf training, surf media, and the real estate market. Culture takes account of the surfer population, surfing associations, surf culture events and history, and recognition by the city (World Surf Cities Network, 2016).

In the case of rural coastal communities in the proximity of surfable waves, these communities inevitably became key stakeholders in surfing resources, with various positive and negative outcomes (Ponting and O'Brien, 2014, 2015; Towner, 2016). Apart from the negative effects and influences brought by the unplanned and rapid advance of the surf tourism industry in various locations around the world, positive outcomes include surfer-volunteerism programmes in community outreach, environmental health, and entrepreneurship empowerment (Waves for Development, 2016). Similarly, SurfAid International (2016) is a well-publicized example of a not-for-profit organization focused on community development through improving the health, well-being and self-reliance of people living in isolated regions, particularly in Indonesia. Thus, the concept of the surf tourism stakeholder broadens to include those who provide, receive, and benefit from community-based health and education in these regions (Ponting and O'Brien, 2015).

### ***Traditional resource custodians***

Traditional resource custodians at surf sites include host communities, such as fishing villages on islands and in developing countries which may have long-standing access rights and interaction with coastal resources. Previous to the global exploration and exploitation of surfing resources in such areas, the significance and value of surf resources were typically not recognized by local communities. As a result, with the arrival of the global surf tourism industry, including groups of travelling surfers on land and by boat, rural host communities had no experience in managing these resources and were unprepared for the social and economic implications and impacts. Buckley (2002) relates that commercial surf charter boats and land-based surf camps have typically operated as enclaves with little meaningful interaction with local host communities. Ponting (in Martin, 2013: 44) identifies the contrast between surf tourism operators and traditional resource custodians: 'The million-dollar boat and the impoverished community'.

Research by Ponting *et al.* (2005) indicates that unregulated free-market approaches to surf tourism development in less developed regions alienate local

people as a single and comparatively powerless or displaced stakeholder group amongst many others. Consequently, local people are often the last to benefit from economic development based upon the exploitation of their resources, yet shoulder the bulk of negative impacts and feel resentment. Indigenous communities risk exclusion from the surf tourism economy (Ponting *et al.*, 2005), and surf tourists may miss out on the opportunity of important cultural exchange to add value to their experience (O'Brien and Ponting, 2013; Ponting and O'Brien, 2014).

A. Abel (in Martin, 2013: 44) explains that in the case of Papua New Guinea (PNG), host communities can be seen as 'traditional resource custodians', a more holistic concept than the contemporary concept of 'land owners'. The failure of other stakeholders to recognize this distinction left locals marginalized in the use of their coastal resources by surf tourists. As President of the Papua New Guinea Surfing Association, Abel has worked to educate and empower local communities through a consultation process aimed at social and economic sustainable development. Abel's approach helps indigenous communities to embrace the benefits of surfing waves as a renewable resource on their own terms, employing practical methods such as limiting the number of users of sites in order to manage social and environmental impacts, while providing economic benefit to the community and a unique cultural experience for the surf tourists. Abel (in Martin, 2013: 44) explains:

We are building a new conceptual 'bottom-up' model to surf tourism, where indigenous communities manage their resources in a sustainable fashion as stakeholders – and this has even helped to promote protection of the surf reefs through abandonment of harmful fishing practices which once used dynamite and cyanide.

O'Brien and Ponting (2013) note that surf management plans have been developed and put in place to solve a variety of issues in PNG where reefs are owned by local villages or clans and the rights to natural resources do not end at the high-water mark as they do in most countries; rather their traditional grounds include the reefs where the surfing activities now take place. Thus, in the case of a commercial surf tourism operation, which utilizes an area to conduct business, it is appropriate for the traditional resource custodians of the reefs to benefit. However, while extracting 'reef fees' for fishing has some cultural heritage in many indigenous communities, managing reefs for surfing is somewhat of a foreign concept to such communities as revealed in the following interview conducted by O'Brien and Ponting (2013) in PNG:

This was a resource that they didn't realize they had. They had the potential to develop, manage, promote, and at the same time, derive a sustainable source of income without denigrating their day-to-day way of life, their culture, or their heritage.

(2013: 168)

At the time of writing, PNG's surf tourism sector serves as the only example in the world of a formalized attempt by indigenous surf resource custodians to collaborate with stakeholders to sustainably manage surf tourism resources and activities through a community-centred strategy. This approach engages resource owners in planning acceptable use of their surfing resources and appropriate compensation (O'Brien and Ponting, 2013).

Fiji serves as another case study in the Asia-Pacific. Ponting and O'Brien's (2014) research notes that traditional fishing grounds have been a source of controversy dating back to the colonial era, and this has been exacerbated by the development of the lucrative commercial surf tourism industry, which consists of as many as 75 tour operators at 120 surf sites. Recent changes in access to these resources by the government have caused tensions to escalate among individuals and communities and created an environment of social and political uncertainty. At the time of writing, new open-access policies to Fijian surf sites have come at the cost of 'de-territorialization' of customary resources and mark a transition from communally-owned common pool resources – and the impacts to sustainability are yet to be determined (Ponting and O'Brien, 2014).

To address these issues, management strategies allied to differing culturally bounded property rights need to be developed accordingly; and Ponting and O'Brien (2014, 2015) suggest that regulatory philosophies and frameworks should consider compensating indigenous resource custodians for the use of their reefs and fishing areas. Their research in PNG (O'Brien and Ponting, 2013), Fiji (Ponting and O'Brien, 2014), and the Mentawai Islands (Ponting and O'Brien, 2015), as well as Towner's (2016) work in the Mentawais, highlights the integral juxtaposition of sustainability and surf tourism; it may also exemplify how the development of surfing activities at the village level can foster better management of surf sites by indigenous communities and other stakeholders through insightful planning for sustainability and increased opportunities for local communities to share in the benefits derived from surf tourism.

### ***Interdependence of stakeholders***

Two paradigms coexist when looking at the contemporary understanding of surfing sites in the social sciences – the global value perspective of the surfing industry alongside the value attributed to specific surfing locations by individuals and local communities. Given the enormous reach of the global corporate surfwear and equipment industries, combined with the increase in the number of individual surfers and surfing communities in the world who contribute to the visitation of sites, these factors encompass many facets of tourism, direct and indirect values, and stakeholder linkages and engagement. While relevant market values are reasonably easy to measure through, for example, domestic and international tourism receipts from surfing schools, camps, and events, the nonmarket values such as the economic benefits of regional and national image, sociocultural aspects, physical fitness, and psy-

chological well-being are more difficult to measure. Nevertheless, nonmarket values touch the lives of millions of surf resource stakeholders in coastal areas across the world.

There has been relatively little research which investigates surfing sites in a holistic systems context, whether in terms of the individual, society, the economy, or focused on the conservation of the natural environment. The study of surf resource systems boundaries theoretically highlights the evidence-based role of the environmental and social sciences in the management of coastal surfing resources, setting the stage for the use of new and interdisciplinary methods in surfing and sustainability research.

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