Chapter 6
Marine Tourism and the Blue Economy: Perspectives from the Mascarene and Pacific Islands

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Abstract The blue economy is built on the principle that socio-economic progress can occur in tandem with environmental protection and sustainable resource extraction. Nations with coastal and ocean-based economies have struggled to realize the promise of the blue economy without taking conciliatory measures. Island nations are especially affected due to their overwhelming reliance on marine tourism and related activities and disproportionate susceptibility to climate change and fluctuating touristic demands. Not all island nations are the same and national ocean economies can be vastly different, dictated by complex geopolitics, cultural models, and social value systems. We explore these facets further through two contrasting case studies from two remarkably different corners of the world—the island of Mauritius in the western Indian Ocean and Pacific Island Countries and Territories. We recommend that marine tourism, the largest component of the Islands' blue economy, must be handled as an anthropogenic stressor subject to environmental assessments, regulatory enforcement, and adaptive mitigation measures. Further, tourism fees levied by different island nations should proportionally allocate funds towards periodic monitoring and restoration evaluation studies. Findings from such studies could facilitate

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participatory decision-making processes and build marine environment and tourism resilience against global disruptions, climate change, and severe habitat loss.

Keywords Marine tourism · Climate change · Marine biodiversity · Small islands

6.1 Introduction—Tourism and the Blue Economy

The coastal and marine tourism industry is a flourishing sector of the blue economy. The "blue economy" encompasses a variety of marine resource exploitation and infrastructure development activities for societal gain as defined by the World Bank and United Nations Department of Economic and Social Affairs (2017). The blue economy concept is built on the principle that socio-economic progress can occur in tandem with environmental protection and sustainable resource extraction. There is debate over the precise definition of the blue economy and the variable application and societal consequences in different regions; however, this has been discussed elsewhere (Voyer et al. 2018; Mallin and Barbesgaard 2020; Chap. 1 of this book) and is not covered here further.

Within the blue economy construct, some dominant activities include maritime activities, such as fisheries, aquaculture, offshore renewable energy development, transport, and tourism. Also, subsumed within the blue economy are non-market value components that include carbon sequestration and biodiversity preservation (World Bank and United Nations Department of Economic and Social Affairs 2017). Undoubtedly, marine tourism is one of the largest revenue sectors in many countries, with a significant impact on coastal community livelihoods, but vulnerable to climate change effects and fluctuating touristic demands (Orams 1999; Hoyt 2001; Moreno and Amelung 2009). In 2006, the estimated global revenue from marine tourism exceeded the combined global revenue from fisheries and aquaculture (Higham et al. 2016 and references therein). The U.S. Economics—National Ocean Watch data indicated that (https://coast.noaa.gov/digitalcoast/data/enow.html) marine tourism and recreation contribute $143 billion to the U.S. gross domestic product (GDP) and employed nearly 2.5 million people in this sector in 2018. Similarly, in the first Marine Economy Satellite Account statistics released by the U.S. Bureau of Economic Analysis, in 2019, the U.S. marine economy accounted for $397 billion or 1.9% of current-dollar U.S. gross domestic product (GDP). Moreover, tourism represented approximately 35% of the marine economy's gross output (https://www.bea.gov/data/special-topics/marine-economy). In Europe, per the 2021 European Union (EU) Blue Economy Report (https://blueindicators.ec.europa.eu/published-reports_en), the gross value added from coastal tourism (the largest sector of the EU blue economy) increased by about 20% in 2018 from 2009, and supported nearly 2.8 million employees. For small islands, the contributions of tourism to national economies can be much more significant, based on tourism receipts.

Globally, big and small coastal nations—especially islands with vast coastlines and natural biodiversity—attract millions of tourists seeking ocean-based activities

and experiences. Conceptually, a blue economy offers the perfect balance between supporting the local economy and maintaining critical habitats and populations. In practice, blue economy concepts like ecosystem-based management and marine spatial planning are variously interpreted by decision-making entities and, thus, implementation can fall far short of promoted ideals (Silver et al. 2015; Voyer et al. 2018). In many situations, revenue and economic sustainability predominate concerns over indigenous and livelihood issues, animal welfare, environmental protection, and unmitigated resource exploitation. Brockington and Stefano (2015) emphasized similar concerns on the redistribution of resources, external investors dictating green sector management through disproportionate influence on governments and marginalizing local voices, and overemphasis on green economy jobs at the expense of limiting land access to existing local populations in the Global South. In profit-based marine tourism-based economies, there is little incentive to sustain resources when there is high and continuous demand, non-existent regulations and limited to no enforcement of existing regulations, and a passive government (Constantine 2014; Higham et al. 2016; Barbesgaard 2018). The result is a moving scale of acceptable trade-offs (Sala et al. 2021). Moreover, climate change is expected to have a disproportionate effect on small island developing state economies due to a combination of storm surges, sea leave rise, and coastal erosion (Pathak et al. 2021).

While trade-offs are inevitable, we argue that a scientific decision-making framework can allow societies and countries to evaluate these trade-offs in terms of costs and benefits, assess and mitigate risk proactively, and decide if any changes can or should be made to existing blue economy or blue growth models. However, analytical frameworks and scientific understanding can only highlight potential cause and effect or ecosystem repercussions. To realize blue economy aspirations, governing entities must have the training and knowledge to trust the data, and the authority to enforce regulations that can secure the livelihoods of tourism-dependent communities and propagate resilience against the inevitable onslaught of climate change, pandemics (e.g., COVID-19), and other global cataclysms. Small island nations are especially vulnerable to the vagaries of economic and climate change due to their overwhelming reliance on marine or coastal tourism, and tradeoffs with other blue economy activities. Not all island nations are the same and national ocean economies can be vastly different, dictated by complex geopolitics, cultural models, and social value systems. In this chapter, we explore these facets further through two contrasting case studies from two remarkably different corners of the world—the island of Mauritius in the western Indian Ocean and Pacific Island Countries and Territories. The assessment and assertions made here can be readily extended or adapted to other nations with developed or developing coastal or marine tourism-based economies.

6.2 Mauritius

Mauritius is a small island of 1,865 km^2 situated on the Mascarene Plateau in the western Indian Ocean, with a population of 1,261,663 in 2019 (Fig. 6.1). It has a

lagoon area of 243 km^2 surrounded by 300 km^2 of coral reef (fringing and barrier). The scenic coastline of Mauritius Island extends over 322 km. It is characterized by various types of shores—sandy, rocky, muddy, cliffs, mixed, reclaimed, and wetlands (Bhagooli and Kaullysing 2019; Bhagooli et al. 2021a).

Mauritian waters are home to about 1,656 species in 290 families of marine organisms, including 160 coral species (Moothien-Pillay et al. 2002; Bhagooli et al. 2017; Fig. 6.2), two mangrove species—*Rhizophora mucronata* and *Bruguiera gymnorrhiza* (Appadoo et al. 2017), 435 seaweed species (Bolton et al. 2012), five seagrass species (Paupiah et al. 2000; Ramah et al. 2014), 340 fish species (6th National Report for the Convention on Biological Diversity) and two sea turtle species—*Eretmochelys imbricata* and *Chelonia mydas* (Ramah et al. 2019). Seventeen species of marine mammals are also known to visit Mauritian waters. Corbett (1994) reports the presence of 13 cetacean species both inshore and offshore Mauritius, with sperm whale *Physeter macrocephalus* (offshore) and the spinner dolphin *Stenella longirostris* (inshore) being the most common and abundant species encountered. Webster et al. (2020) documented several other cetacean species in Mauritian waters from 2008 to 2014. Although studies on marine species' rarity and/or endemism are scarce in Mauritian waters (McClanahan et al. 2021).

Fig. 6.1 Moka Range seen from Le Pouce mountain, Mauritius (Photo by Ranjeet Bhagooli)

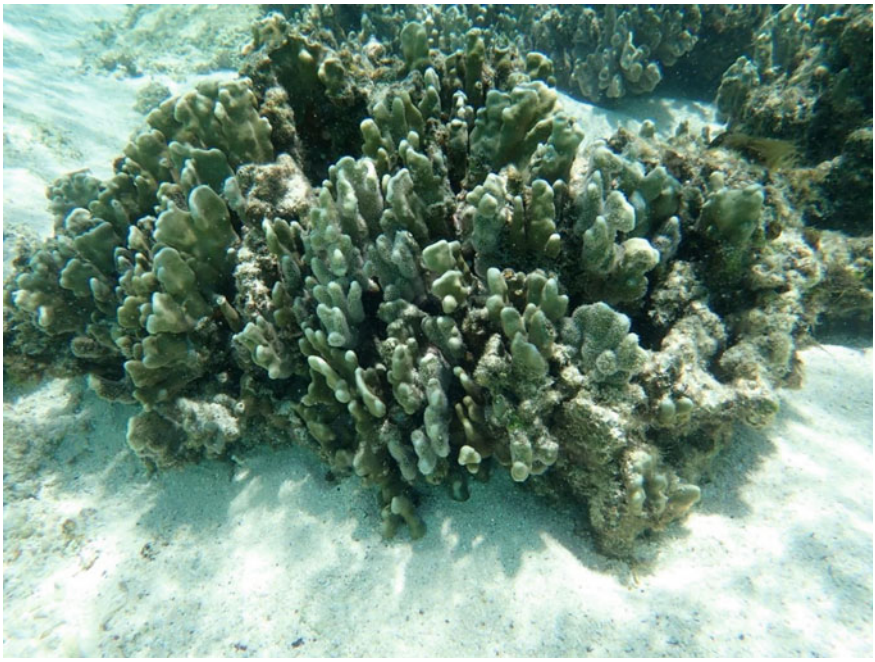

Fig. 6.2 Blue corals, Flat Island, Mauritius (Photo by Ranjeet Bhagooli)

6.2.1 Tourism Revenue

Tourism in Mauritius is one of the leading economic pillars and is predominantly coastal-based and dependent on the level of conservation and preservation of the local marine biodiversity. Tourist arrivals have been increasing from 72,915 in 1974 to 1,383,488 in 2019, a more than 18-fold increase (Fig. 6.3). The principal tourist markets were France (21.8%), United Kingdom (10.2%), and Reunion Island (9.9%) in 2019. Tourism receipts for 2019 are estimated at MUR 63,107 million (~USD 1,469 million; EUR 1,244 million), with a contribution of 8.1% (in 2019) to the Gross Domestic Product (GDP) of Mauritius, compared to MUR 503 million (~USD 12 million) in 1983. Direct employment in hotels, restaurants, and travel and tourism establishments employing 10 persons or more was 31,827 in 2019 compared to 4,360 in 1983. Employment in these establishments increased by 1.2% in 2019 as compared to 31,455 for 2018. The average length of stay for a tourist is estimated at 10.6 nights (Handbook of Statistical Data on Tourism 2019). In Mauritius, around 1,500 skippers have licenses to operate sea activities. Of these, 60 skippers and 40 operators (including tour operators, canvassers, and agencies) manage dolphin-watching activities year-round in the region of Tamarin and nearby (Gowreesunkar and Rycha 2015).

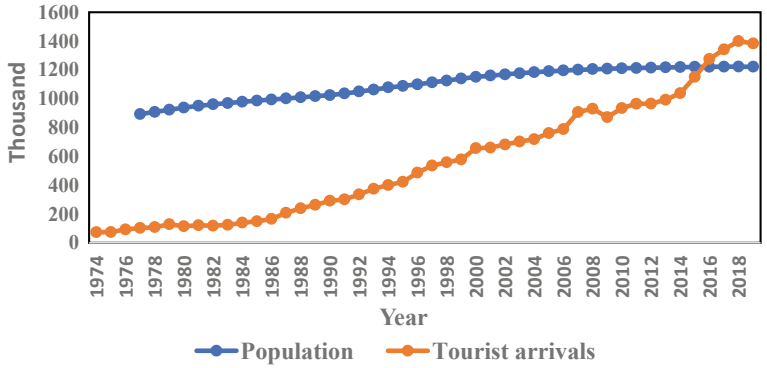

Fig. 6.3 Human population (blue: 1977–2019) and tourist arrivals (orange: 1974–2019) trends in Mauritius Island (Handbook of Statistical Data on Tourism 2019)

An increase in tourist arrivals over the past decades has led to the rapid expansion of the marine tourism industry. The main contributors of tourism to the GDP of Mauritius include freeport activities (competitive logistics and distribution center for international trade, hotels and restaurants, leisure boat activities, and ship store and bunkering) (Freeport Act 2004; Cervigni and Scandizzo 2017).

Coastal areas of Mauritius have recently witnessed uncontrolled and non-strategic development, and increased construction of buildings. The number of licensed tourism activities along the coastal zone and in the marine environment has also increased dramatically. A total of 559 new licenses were issued during the financial year 2018–2019, which include 102 Tourist Enterprises licenses, 106 Pleasure Craft licenses, 267 Skipper Licenses and 84 Tourist Accommodation Certificates (Ministry of Tourism Annual Report 2019). The Central Statistical Office/Bureau gathers information mostly on tourist arrivals. The peak tourist season is generally during the Southern Hemisphere summer season from October to January.

In Mauritius, the Marine Conservation Division of the Ministry of Blue Economy, Marine Resources, Fisheries and Shipping is responsible for the long-term protection and conservation of marine biodiversity and habitats for sustainable use while maximizing socio-economic benefits. The ministry aims to achieve these goals through the management of the eight Marine Protected Areas (MPAs); assessment of coastal development and tourism-related projects; and regulation of permissible activities through the issue of permits for the Blue Bay Marine Park and interference permits for the other MPAs; among others. MPA managers can limit and/or prohibit damaging touristic activities, control the number of visitors, educate visitors, and assess visitor use impacts (Laffoley et al. 2019). In addition, to foster the engagement of local NGOs, coastal communities, and fishers in the protection and conservation of coastal areas and marine areas and resources, Mauritius has also adopted the concept of designating coastal areas as Voluntary Marine Conservation Areas (VMCAs). The VMCAs are local NGO- and community-driven, and do not fall under any legal entity for enforcement. VMCAs consist of important biodiversity areas worth protecting

and ecotourism is encouraged through controlled visits and awareness campaigns. In Mauritius, currently, there are VMCAs in the lagoons of Pointe d'Esny (managed by the NGO Eco-Sud); Roches Noires and Anse La Raie (managed by the NGO Reef Conservation); and St. Felix (managed by the NGO Coral Garden Conservation). The effectiveness of these VMCAs is highly variable and questions about equity, social justice, and connectivity across VMCAs are concerns. Also, Eco-Sud and Reef Conservation provide marine eco-guide or naturalist training to skippers, coastal inhabitants, graduated students, and fishermen to help them seek alternate livelihoods in the tourism sector. The Ministry of Tourism, in consultation with relevant stakeholders and the assistance of the Mauritius Standards Bureau, has developed an eco-label for tourism operators to promote sustainable tourism. The idea is that the eco-label will attract environmentally conscious consumers and tourists. The grant scheme provides a centralized framework and is anticipated to improve environmental performance and maximize the efficient use of resources, among other objectives (Ministry of Tourism and Leisure Eco Label Grant Scheme).[1]

6.2.2 Regulatory Frameworks

The Mauritian Ministry of Tourism regulates and permits, or prohibits, most of the sea-based activities in the country, while the Tourism Authority and the National Coast Guard (NCG) enforce these regulations. The Ministry of Blue Economy, Marine Resources, Fisheries and Shipping is concerned with the area where the activity is being carried out. This ministry provides guidelines regarding minimizing impacts on fishing activities, fishermen/Fish Aggregating Devices/conservation zones/aquaculture sites, and the marine environment in general, and demarcates operation zones for various marine structures (e.g., jetty, pier, marina) as defined by the Fisheries and Marine Resources Act (2007). The government also emphasizes the development of environmental impact assessments for all businesses operating in the tourism sector.

The Tourism Authority (Dolphin and Whale Watching) Regulations (2012) of the Tourism Authority Act provide guidelines for dolphin and whale watching activity in Mauritius, primarily prohibiting physical contact, feeding, and any kind of noise pollution near marine mammals. A no-approach zone of 50 m radius from the closest dolphin and 100 m from the closest whale is also prescribed to avoid causing any form of harassment or disturbance to the mammals. All the activities are assessed and reviewed at the level of the National Coordination Committee for sea-based tourism activities of the Ministry of Tourism. The guidelines to regulate dolphin watching activity and the conduct codes have been developed with the help of a non-governmental organization (NGO), the Mauritius Marine Conservation Society,

[1] http://www.tourismauthority.mu/userfiles/file/tourismauthority/eco-label/Ministry_of_Tourism_A5_Brochure.pdf.

plus the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP) (Gowreesunkar and Rycha 2015).

Regulated tourism activities in Mauritius that are considered as contributing to the blue economy include sea walking (equipment-aided walking on the seafloor), parasailing, kite surfing, water-skiing, SCUBA diving, kayaking, big game fishing, speed boating, catamaran trips, and glass bottom boat visits to shallow ecosystems. Jet skiing has been banned since 2016 in Mauritius (Tourism Authority [Prohibition of Jet Ski] Regulations 2016), as it is considered as a hazardous and unsustainable practice that may cause considerable damage to coastal and marine ecosystems, especially coral reefs (L'Express 2016). Dolphin watching is performed by local tour operators in boats, catamarans, and speed boats. This activity, has existed since 1998, was initiated by the biologist Delphine Legay for research purposes and was continued as a business by tour operators after her death. Dolphin tours occur mostly on the west coast of the island, primarily from the public beaches of Tamarin and Black River, and from hotels off Flic en Flac and Le Morne.

The Ministry of Tourism has declared non-motorized zones in the north of the island at Mont Choisy and Pereybere, designated specific swimming zones in public beaches, and has also well-demarcated embarkation points to ensure public safety. Tourist-related activities are further regulated in marine parks of the island—Blue Bay and Balaclava Marine Parks. Both were proclaimed national parks in October 1997 under the "Wildlife and National Parks Act 1993" and declared as Marine Park and Marine Protected Areas (MPAs) in June 2000 under the "Fisheries and Marine Resources Act 1998", amended in 2007.

Situated in the southeast of Mauritius, the Blue Bay Marine Park (BBMP) extends over 3.53 km^2 and is mostly visited by tourists for its pristine and ancient coral beds. It is enclosed by coral reefs protecting it from oceanic waves. The site was classified as a Ramsar Convention Wetlands of International Importance in 2008. The BBMP is divided into several zones depending on the various activities allowed. The MPA provides a wide variety of services to communities in addition to its direct conservation function—coastal protection zone, fish spawning, tourism/recreation, conservation, species protection, scientific research, and education areas. In 2011, 422 permits for authorized activities were issued for operation in BBMP (146 for boats/vessels, 67 for commercial activities, 99 for line fishing, 83 for recreational activities, 8 for temporary interference and 19 for basket traps). Activities such as swimming, snorkeling, diving, skiing, fishing, and -glass-bottom and non-motorized boating at the Marine Park are regulated by the Ministry of Blue Economy, Marine Resources, Fisheries and Shipping.

6.2.3 Tourism Impacts and Mitigation

Construction of hotels, resorts, coastal tourism residences and second homes along the coastal zones of Mauritius has considerably contributed to coastal erosion and degradation of intertidal and coastal habitats (Baird 2003; Bhagooli and Kaullysing

2019). Following the increase in the number of tourist arrivals, the country witnessed a boost in tourist accommodation construction along the coastal zones (Bhagooli et al. 2021b).

The Albion Fisheries Research Centre (AFRC), under the aegis of the present Ministry of the Blue Economy, Marine Resources, Fisheries, and Shipping, monitored five stations at BBMP for live coral cover. At one station, total live coral cover increased from 12% in 2010 to 32.15% in 2011, while at two other stations it decreased from 61.9 to 50.95% and from 38.1 to 36.4%. Other stations had an overall coral cover of less than 0.1% during both years (Ministry of Fisheries and Rodrigues Annual Report 2011). Bacha Gian et al. (2017) reported a gradual increase in overall live coral cover in the BBMP after the 2009 coral bleaching event, although from 2002 to 2010 a decline in coral cover was noted on Mauritian coral reefs. Conversely, McClanahan and Muthiga (2021) reported a decline in coral cover in BBMP wherein the percentage coral cover decreased at two sites from 57.5 and 29.8% in 2004 to 27.3 and 24.1% in 2019, respectively. Twenty-two out of the 24 coral taxa reported in 2004 were lost by 2019.

Furthermore, Bhagooli et al. (2021a) compared coral site data from 2005 and 2010 with 2002 data and noted declines in coral cover as drastic as 90–100% at some sites, with significant phase-shifts from coral to algal-dominated reef sites. Even in uninhabited islets like Gabriel there is a decrease of about 50% in coral cover between 1998 and 2018 (Bhagooli et al. 2021b). Also, *Stegastes* fish associated with the bleaching-susceptible branching coral *Acropora* provide indirect protection from predation to bleaching-resistant massive *Porites* and the loss of such *Acropora* coral cover due to ocean warming events may jeopardize the health of bleaching survivors like *Porites* (Tiddy et al. 2021). In terms of rare and/or endemic coral reef fish, only three (Mauritian Gregory, Mauritian anemonefish, and Blacklip damselfish) out of 10 such targeted species were found in Grand Port district, which includes BBMP (McClanahan et al. 2021).

The Balaclava Marine Park (BMP) is in the northwest part of the island and extends over 4.85 km^2. The marine park is divided into different zones, although management of the zones has not been fully implemented (Bhagooli and Kaullysing 2019). In BMP, 23 artisanal fishing boats, 6 glass-bottom boats, 17 speedboats, 6 security/rescue boats, 9 diving/snorkeling boats, 2 parasails, 22 pedalos or variously shaped pedal boats, 46 kayaks, 22 sailboats, 23 windsurfing boards/sails, and 124 snorkeling sets operated in 2011. Monitoring of live coral cover at seven stations at BMP revealed a decrease in percentage coral cover from 2010 to 2011 at four stations (51.8–10.5%, 49.3–33.1%, 63.6–56.4%, and 32.6–30.3%), and an increase at the remaining three stations during the same period (42.7–55.3%, 7.2–9.2%, and 24.9–26.4%) (Ministry of Fisheries and Rodrigues Annual Report 2011).

Monitoring surveys have been recurring since Blue Bay and Balaclava were proclaimed marine parks, but no in-depth scientific evaluation of the effectiveness of the regulations at the marine parks has been published. This makes it difficult to gauge the effectiveness of these measures in conserving the biodiversity and tourism-related uses of the protected marine parks. Landscape changes during construction activities in the coastal region of Balaclava (in the vicinity of the BMP) between 2006

and 2021 are shown in Fig. 6.4. Most of the hotels in this region were constructed or underwent major renovation prior to 2003. Additionally, the only airport of Mauritius that is located near the BBMP was expanded in the early 2010s and a new runway was also constructed (Fig. 6.4d–f). A new resort also was built in 2019 in this region (Fig. 6.4d–f). These developments may have caused an impact on the resources and habitats in the nearby marine protected areas. In addition to the influence of warming-induced mass coral bleaching/mortality, localized changes in the landscape over the years due to human activities might have led to changes in seascapes and coastal habitats. Coastal developments that lack consideration of their short- and long-term local impacts on coastal and marine ecosystems and habitats are prevalent. Illegal sand mining from beaches, dunes, and reef flats was carried out without appropriate authorization to nourish or reprofile beach areas in front of hotels (Duvat 2009).

Some mitigation measures of damaged reefs through coral "restoration programs" are in place with the support of the local concerned Ministry, UNDP (https://www.adaptation-undp.org/projects/Mauritius-Seychelles-Marine-AF), local NGOs, and hotels in Mauritius. So far, the focus is on establishing coral nurseries. However, the effectiveness of coral gardening/farming concepts and practices have yet to be thoroughly and independently assessed in Mauritius. Published scientific studies on coral transplantation/rehabilitation are rare from Mauritius. Pilot studies suggest that *ex-situ* coral culture may be a useful tool for coral conservation initiatives (Moothien Pillay et al. 2011). Bhagooli et al. (2021c) reported fragment-size dependency for coral nubbin mounted on concrete blocks for *Acropora muricata*, one of the thermally susceptible coral species. Further scientific investigations are required to support coral restoration activities with the engagement of tourists and the tourism industry in Mauritius.

Gowreesunkar and Rycha (2015) assessed the impacts of dolphin watching activities in Mauritius, as documented by a sample of 37 out of 40 tour operators, and 53 out of 60 local skippers operating along the west coast. Positive impacts included economic prosperity and employment generation and a willingness to protect marine life. Unfortunately, Gowreesunkar and Rycha (2015) found that compliance with guidelines was poor. For example, the 50 m no-approach zone was not observed, single animals were chased and exit routes blocked, and the skippers or tourists whistled or tapped in the water to attract the animals and often approached the animals at high speeds (Fig. 6.5).

Other activities, such as trampling while snorkeling and SCUBA diving, walking on shallow intertidal habitats or coral reef flats, extreme sports creating acoustic disturbance, crabbing, and gleaning have been reported to have serious impacts on coastal and marine environments (Beeharry et al. 2020). Still, there remains uncertainty about the direct impacts of these activities in Mauritius due to lack of research and reliable published data. Along with this gap in research, there is also ambiguity on the number of actual tourism operators (Duvat 2009), which makes it challenging to estimate, project, quantify and manage the damage caused to the coastal and marine environment. Nevertheless, unabated human trampling and mechanical fracturing of coral reefs during aquatic activities can have lethal and sub-lethal effects on certain coral species, as discovered in other regions (Rodgers et al. 2003).

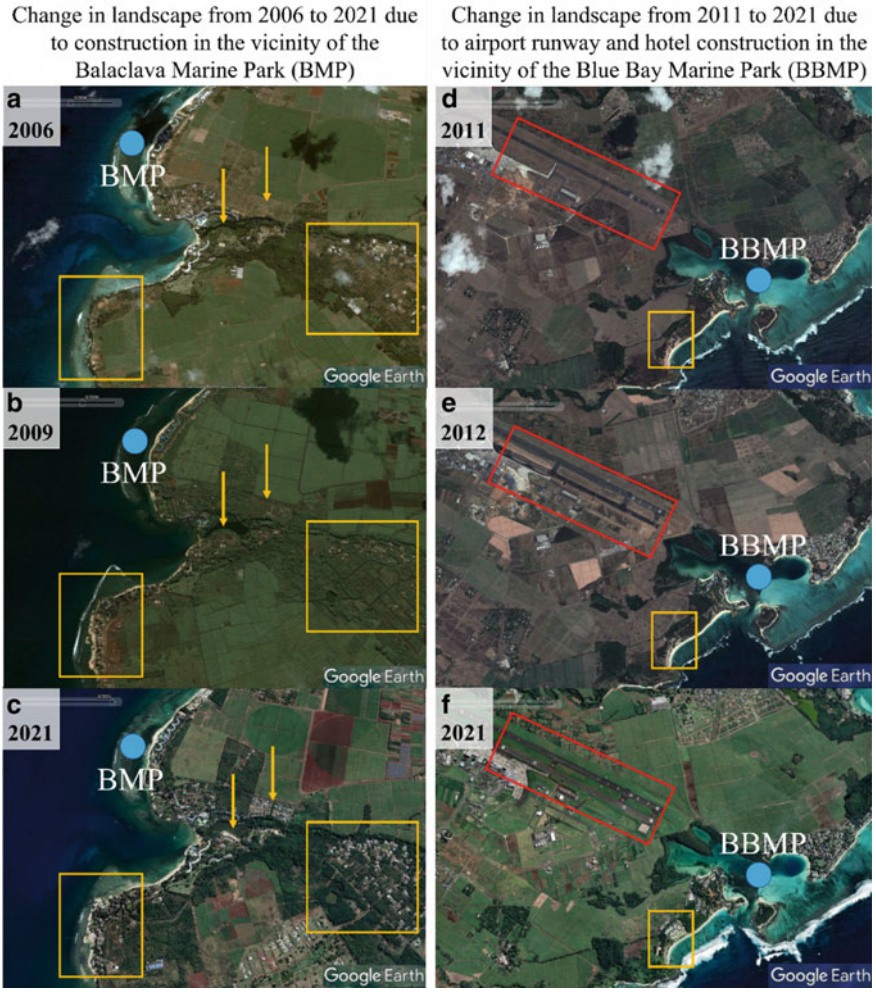

Fig. 6.4 **a–c** Resort/hotel construction along the coastal zones of Balaclava in the vicinity of the Balaclava Marine Park (BMP) showing a change in landscape from 2006 to 2021 (yellow boxes); **d–f** Change in landscape shown from 2011 to 2021 due to airport runway (red box) and resort construction (yellow box) in the vicinity of the Blue Bay Marine Park (BBMP). Image source: Google Earth.

Limited research has been carried out on the impacts of tourism activities on the marine environment and associated resources in Mauritius. A large gap exists between tourism and science in Mauritius and therefore, less investment in building resilience against the onslaught of climate change and tourism pressures. The country is data-deficient in terms of studying, understanding, and mitigating impacts resulting from the individual as well as combined marine tourism activities. Stakeholder interviews to gauge environmental impacts of tourism such as those conducted by

Fig. 6.5 (Top) Multiple tour boats lining up to search and follow dolphins. (Bottom) Swimmers in the water around a bottlenose dolphin near Tamarin, Mauritius during a dolphin sighting trip. Photos by Mridula Srinivasan

Gowreesunkar and Rycha (2015), Beeharry et al. (2020), and Gutleea et al. (2021), are useful but do not accurately capture the ecological ramifications in coastal and marine habitats from relentless and unregulated tourism. Reasons for the dissociation of tourism from science could be due to a lack of awareness about research benefits, perception that tourism is a benign activity, or that accepting or supporting scientific conclusions could jeopardize economic aspirations.

Mauritius witnessed a shift from the "Ocean Economy" concept in 2013 to "Blue Economy" in 2019. While terrestrial ecotourism (e.g., eco-tours/visits at Ile aux Aigrettes Nature Reserve) is common, being an island nation marine ecotourism has caught on, providing a source of alternate income, especially for fishing communities. For instance, when the Blue Bay Marine Park (BBMP) was established in 1997 to conserve biodiversity and control touristic and fishing activities, the fishers operating in that region were given the choice of modifying their fishing permits/registration and shifting their fishing activities to other regions of the island. Certain fishermen opted for shifting to other regions, while some became tour operators and glass-bottom boat skippers in the BBMP, with limited instruction on guidelines and regulatory practices.

Some hotel chains in Mauritius are owned by global companies. A study conducted by Fauzel et al. (2016) to analyze the impact of tourism Foreign Direct Investment (FDI) on the economic growth of Mauritius revealed a positive relationship between tourism development and economic growth of the island. The authors highlight that through the adoption of measures aimed at opening the economy, foreign investment was allowed by the government to develop key tourism assets such as restaurants, yachts, and travel agencies, among others. These policies have served to attract more FDI in the sector, attracted capital for further investment, and led to a large increase in direct and indirect employment. The downside of relying on foreign investments is that their levels can fluctuate, influenced by global market and consumer trends. Moreover, an increased presence of foreign investors can reduce the role of local communities in managing their ocean resources and potentially influence government entities to embrace a solely profit-based tourism culture.

On 6 August 2020, an oil spill emanated from the MV *Wakashio* that ran aground on the pristine reef/lagoon of Pointe d'Esny on the southeast coast of Mauritius. Over 1,000 tons of oil is estimated to have leaked into surrounding waters (Lewis 2020). The grounding of the MV *Wakashio* impacted coral reefs adjacent to the incident site, leading to excessive and recurring sedimentation plumes in the lagoon and potentially, smothering corals and other photosynthetic marine organisms (Fig. 6.6). The oil spill rapidly spread in the lagoon and towards the southeast and east coasts, adversely impacting the marine flora and fauna, especially mangroves—threatening the intricate connection among coral reefs, mangroves, and seagrass beds. This event led authorities to temporarily ban all tourism and fishing activities in the region. Consequently, several tour operators lost their jobs and faced hardship in trying to secure an alternate source of income. The highly frequented Blue Bay Marine Park and Ile aux Aigrettes nature reserve were declared off limits (Seveso et al. 2021). The oil spill was considered particularly serious because of the location of the spill—near a Ramsar site—rather than the quantity of oil released into the water. Like the 1989

oil spill from the *Exxon Valdez* and the 2010 *Deepwater Horizon* oil spill in the United States, the effects of the spill are likely to last for decades and require careful and rigorous environmental monitoring and habitat restoration.

In addition to acute impacts from events like the MV *Wakashio* spill, global climate change is occurring at an accelerated pace, compounding the negative impacts on marine ecosystem from other stressors. The Intergovernmental Panel on Climate Change (IPCC) report predicts that small island nations will be particularly susceptible to projected increases in sea level rise, cyclone activity, changing rainfall patterns, and warmer water and air temperatures (Nurse et al. 2014). The rate and intensity of climate change effects are especially evident in coral reef habitats experiencing frequent bleaching events and inhospitable environments. The rate of recovery and restoration of these systems are misaligned with the onslaught of environmental change and other synergistic human activities. Thus, tourism activities built on exploiting specific resources or habitats may cease to exist if the resource is depleted either due to unsustainable tourism practices, climate change impacts, or a combination of both.

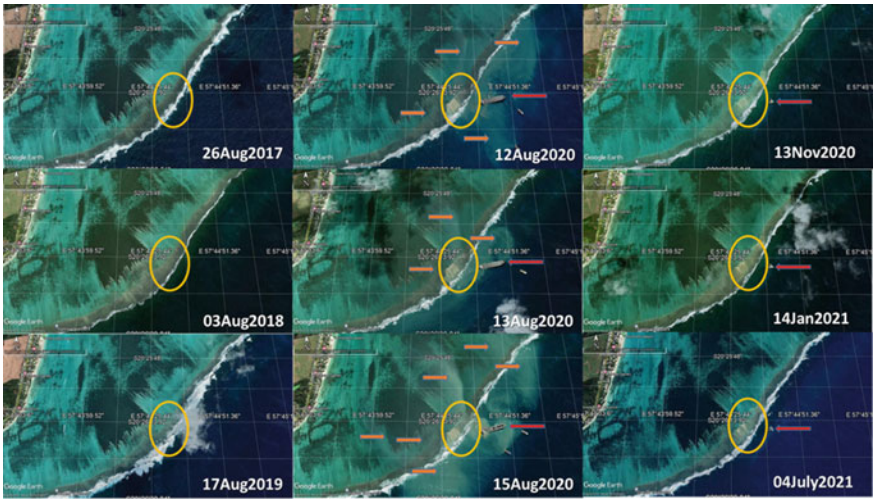

Fig. 6.6 Google Earth images captured on 26 August 2017; 3 August 2018; 17 August 2019; 12, 13, and 15 August 2020; 13 November 2020; 14 January 2021; and 4 July 2021. The red arrow, orange arrow and yellow circles indicate the position of MV *Wakashio* and/or its remnants, potential sediment plumes, and areas with and without excessive and recurring sedimentation, respectively

6.3 Pacific Islands Countries and Territories

Most tourism in the Pacific Ocean region could be classified as the Blue Tourism Economy. Despite a common depiction of many Pacific Island Countries and Territories (PICTs) as homogenous, there is much diversity among these locations. The impression of these tourist destinations from colonial times has been reinforced and perpetuated for centuries as tropical paradises with warm weather, crystal blue waters, white sandy beaches, and friendly welcoming locals (Fig. 6.7, Harrison 2001). But there are notable differences among these PICTs in terms of geography, culture, and history, and these all have a bearing on the number of tourists and the characteristics of tourism and its development.

The Pacific Ocean is the world's largest ocean basin, covering an area of 165,200,000 km^2. More than 10,000 islands are in this ocean, with a population of just over 13 million people. Even this statistic is somewhat misleading since the population of Papua New Guinea makes up two-thirds (8.7 million) of that total. A common, although blunt, categorization of PICTs (comprised of about 22 countries and territories) is to differentiate among Melanesia, Polynesia, and Micronesia based on physical geography—with Polynesia having an abundance of coral atolls, Melanesia more likely to have volcanic islands, and Micronesia having a mix (Harrison and Pratt 2013). Culturally, the Polynesian PICTs tend to be more ethnically homogeneous,

Fig. 6.7 Monuriki, Fiji (Photo by Stephen Pratt)

and Melanesian countries such as the Solomon Islands and Vanuatu are characterized by numerous people groups with different dialects and customs within their borders. Due to its colonial past, Fiji has a strong ethnic divide, which has resulted in political unrest from the late 1980s.

Often referred to as Small Islands Developing States, in the Pacific many scholars and Pacific Islanders are now seeing themselves as the Big Ocean States, emphasizing the large ocean resources they have, rather than their small land areas. This attitude has developed due to the large distances between individual countries and even within the same country. For example, in Kiribati, Kiritimati (Christmas Island) in the east is more than 3,000 km from Tarawa, the capital, with no direct air link. The large ocean resources of PICTs have driven much of the tourism in the Pacific. Encompassing a range of marine ecosystems from fringing and offshore coral reefs, mangroves and littoral forests, seamounts to seagrass habitats, the PICTs boast more rare, endangered, and protected species per capita than any other region in the world. The PICTs are unrivaled in marine species diversity and include a variety of whales and dolphins, seabirds, sea turtles, sharks, reef fishes, dugongs, and are home to the largest tuna fisheries (*Source* Secretariat of the Pacific Regional Environmental Programme http://archive.iwlearn.net/sprep.org/topic/NatRes.htm, Jupiter et al. 2014).

6.3.1 Tourism Revenue

Up until 2020 and the onset of the COVID-19 pandemic, tourism in PICTs grew steadily. Table 6.1 shows several measures of tourism size and impact for 17 PICTs.

Collectively, these 17 PICTs hosted 2,259,357 international tourists in 2019. But, there is a wide variation in the degree of tourism in each destination. Fiji (Fig. 6.8) hosted almost 900,000 tourists in 2019, roughly the same number as its population. At the other extreme, only 3,611 international tourists visited Tuvalu, one of the least visited countries in the world. Tourists spent just over USD 4 billion in the region in 2019, an average of USD 2,188.02 per capita population, again with substantial variation. With a population of 15,212, the Cook Islands has extremely high receipts per capita population, at USD16,053, while at the other end of the spectrum, visitors to Papua New Guinea and Kiribati spent an average of USD 40 and USD 79 per capita, respectively, reflecting their small-sized tourism sectors, but large populations. Tourism receipts per tourist averaged USD 1,648.68 across the 17 PICTs; the length of stay for tourists averages 10.7 days. French Polynesia, Solomon Islands, and Federated States of Micronesia (FSM) rank in the top three in tourism receipts per arrival, reflecting the more expensive nature of their destinations

Table 6.2 shows a different set of tourism indicators. Tourism earnings as a percentage of GDP averaged 17.3% across the 17 PICTs. Nevertheless, there is much variability. The Cook Islands are highly tourism-dependent, with tourism earnings being 66.1% of GDP. Fiji, Palau, Samoa, and Niue are also heavily reliant on tourism. Across the 17 PICTs, an estimated 90,821 people are employed directly in the tourism sector. The number of accommodation places and the number of rooms is another

Table 6.1 PICTs Tourism Arrivals and Receipts in the PICTs with the top 3 island nations shown in bold

PICTs	International arrivals (2019)	International Receipts (2019) ($US millions)	Receipts per capita ($US)	Receipts per arrival ($US)
American Samoa	19,237	$21.2	$374	$1,102
Cook Islands	171,606	$244.2	$16,053	$1,423
Fiji	894,389	$1,396.0	$1,566	$1,561
French Polynesia	236,642	$744.0	$2,677	$3,144
Kiribati	7,906	$9.2	$79	$1,164
Marshall Islands	10,771	$21.1	$386	$1,959
Federated States of Micronesia	19,712	$44.4	$422	$2,252
New Caledonia	130,458	$291.4	$1,070	$2,234
Niue	10,210	$7.8	$4,924	$764
Palau	94,030	$123.0	$6,873	$1,308
Papua New Guinea	158,390	$352.2	$40	$2,224
Samoa	173,920	$201.0	$1,018	$1,156
Solomon Islands	28,930	$78.2	$112	$2,703
Timor-Leste	111,400	$222.8	$172	$2,000
Tonga	67,517	$55.0	$550	$815
Tuvalu	3,611	$2.4	$229	$665
Vanuatu	120,628	$187.6	$651	$1,555

Source SPTO (2020)

measure of the size of the tourism sector from the supply side, but also indicates the size of each accommodation place. Fiji has a higher number of large resorts and hotels, including numerous internationally branded hotels, so the average number of rooms per accommodation place averages 30.5. Many of the other PICTs average 10–15 rooms per accommodation place, emphasizing the Micro Small Medium-Sized Enterprises (MSME) nature of this subsector of the tourism industry.

Table 6.3 shows the main source markets for the different PICTs. The main source markets for each PICT tend to follow geographic proximity and political/colonial ties (Harrison and Pratt 2015). The Melanesian PICTs' (Fiji, Vanuatu, Solomon Islands, PNG) main source markets are Australia. The Polynesian PICTs' (Tonga, Samoa, Cook Islands, Niue) main source market is New Zealand, while Micronesian PICTs' main source market is Asian countries. However, Europe and particularly France is the main source market for the French Overseas Territories of New Caledonia and French Polynesia. The United States, by having political ties with the Marshall Islands and American Samoa has higher representation in those PICTs.

PICTs also vary in terms of the primary motivations that tourists travel to the Pacific. While most PICTs are leisure destinations, countries such as Kiribati,

Fig. 6.8 Coral coast, Fiji (Photo by Spencer Pratt)

Marshall Islands, Papua New Guinea, Solomon Islands, and Tuvalu have a relatively high proportion of business visitors, which are classified for statistical purposes as tourists. These tourists tend to be consultants and experts who visit to work on development issues and have a relatively long length of stay. Several PICTS also have a large proportion of international tourists visiting friends and relatives. These destinations include American Samoa, Samoa, and Tonga, where a large segment of diaspora return to reconnect with their extended families.

Throughout the Pacific, there is a range of ecotourism operations related to the blue economy. These include scuba diving, snorkeling, surfing, kite surfing, dolphin and whale watching, yachting, and sailing. However, some Pacific destinations are better known for some of these activities and have developed their tourism products sustainably with a good reputation.

For example, on the island of Aitutaki in the Cook Islands, the annual Manureva Aquafest Kitesurfing Competition is held every August (Becken and Hay 2007). The week-long festival includes kitesurfing freestyle and race competitions, stand-up paddleboarding (SUP), outrigger canoeing, and a host of social activities. Scuba diving is particularly popular in the Solomon Islands, where fierce fighting in World War II led to the sinking of numerous ships and aircraft from both sides. These wrecks are now major attractions for scuba divers to explore (Panakera 2007). Fiji also has several unique scuba diving experiences where tourists can swim with manta rays (Murphy et al. 2018) or hand-feed sharks (Ward-Paige et al. 2020). Humpback whales

Table 6.2 PICTs and Mauritius Island Tourism Indicators and Supply

PICT	Tourism earnings as a % of GDP	No. Tourism Employees	Total No. of Accommodations	Total No. Rooms	Average length of stay (days)
American Samoa	3.3	1,709	20	263	8.1
Cook Islands	66.1	2,386	805	3,300	8.4
Fiji	25.8	15,094	423	12,888	9.6
French Polynesia	12.8	11,842	382	4,281	14.9
Kiribati	5.1	449	52	525	8.4
Marshall Islands	9.5	605	12	281	18.5
FSM	17.7	794	29	NA	9.0
New Caledonia	3.1	5,241	191	3,360	16.8
Niue	28.1	291	39	197	10.7
Palau	38.0	2,690	118	2,409	5.2
Papua New Guinea	1.5	25,000	501	6,195	10.2
Samoa	24.5	2,852	150	2,747	8.5
Solomon Islands	5.1	1,118	181	1,991	15.1
Timor-Leste	14.2	2,586	64	NA	10.0
Tonga	11.1	3,000	156	1,300	13
Tuvalu	5.6	87	10	NA	7.6
Vanuatu	22.6	15,000	867	1,722	8.1
Mauritius	**8.1**	**31,827**	**112**	**13,489**	**10.6 (nights)**

Source SPTO (2020), Digest of International Travel & Tourism (2019), Handbook of Statistical Data on Tourism (2019)

(*Megaptera novaeangliae*) visit Tonga and Niue from June until mid-October (IFAW, 2009). Becken and Hay (2007) estimated that the benefits from whale watching in Tonga grew from USD 500,000 per year in 1999 to USD 5 million per year by 2009.

6.3.2 Economic Value of Marine Tourism in PICTs

Several studies have been conducted estimating components of marine-based tourism in the Pacific. For example, Pascal et al. (2015) in their study of Vanuatu, report that, in 2013, a total of approximately 47,000 dives were undertaken, which equates to

Table 6.3 Source markets for tourists

PICTs	Australia (%)	New Zealand (%)	North America (%)	Europe/UK (%)	Asia (%)	Pacific Islands (%)	Other (%)
American Samoa	3.9	15.0	24.1	2.5	4.7	49.0	0.6
Cook Islands	16.1	66.7	7.1	7.2	1.3	1.1	0.6
Fiji	43.4	21.9	11.1	6.1	10.6	6.4	0.6
French Polynesia	5.0	4.7	37.5	34.5	11.0	2.9	4.3
Kiribati	19.4	8.7	23.3	7.8	11.2	26.5	3.3
Marshall Islands	3.9	2.2	26.7	2.7	26.1	34.0	4.5
FSM	N/A						
New Caledonia	19.6	8.5	1.1	36.0	20.4	12.7	1.8
Niue	9.7	79.1	2.4	5.0	1.6	2.0	0.1
Palau	0.5	0.1	6.1	0.4	91.3	0.7	0.8
Papua New Guinea	49.0	5.1	5.1	6.3	29.1	4.0	1.3
Samoa	20.9	45.5	6.7	2.8	4.4	18.3	1.4
Solomon Islands	39.5	6.6	7.0	5.5	19.9	19.7	1.7
Timor Leste	12.8	0.9	2.2	11.1	71.2	0.1	1.7
Tonga	20.7	45.2	14.5	6.7	6.9	5.3	0.8
Tuvalu	12.6	8.5	6.4	9.7	20.4	35.6	6.7
Vanuatu	52.6	10.6	2.8	6.2	4.3	21.1	2.4

Source SPTO (2017); N/A = Not Available

about 9,000 divers. Almost two-thirds of the dives took place in Efate, Vanuatu. In addition, 9,000 snorkel trips were recorded. The corresponding value-added of the dive shops is estimated at approximately USD 1,600,000 in 2013 (USD 1,100,000 in Efate and USD 500,000 in Santo, Vanuatu) (Pascal et al. 2015). In total, the annual economic value of marine and coastal ecosystem services in Vanuatu in 2013 on tourism and recreation was estimated to be USD 9.59 million.

Rouatu et al. (2017) sought to estimate the economic value of tourism from marine and coastal ecosystem services in Kiribati. In 2015, they estimate the value to be USD 3.9 million, which should be sustainable if pollution and damage from tourists are controlled. Within the same Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) project, the economic value of tourism from

marine and coastal ecosystem services in Tonga is estimated to be between USD 2.0 and 4.9 million, which will be sustainable if pollution and damage from tourism development and tourist activities are monitored and controlled (Salcone et al. 2017). In the Solomon Islands, the tourism component of the economic value of tourism marine and coastal ecosystem services was estimated to be USD 15.8 million (Arena et al. 2015).

In Palau, Vianna et al. (2010) compare the value of shark tourism with the fisheries value of sharks. The shark-diving industry attracts 8,600 divers each year or approximately 21% of the divers visiting Palau. The value of sharks, in terms of tourism, to the Palauan economy was estimated to be USD 18 million per year, which is approximately 8% of Palau's GDP. An individual reef shark in Palau was estimated to have an annual value of USD 179,000, extrapolated up to a lifetime value of USD 1.9 million to the tourism industry. The annual income in salaries paid by the shark-diving industry to the local community was estimated to be USD 1.2 million. A fishery targeting the same 100 sharks that are interacting with the tourism industry in Palau would obtain a maximum of USD 10,800, or 0.00006% of the lifetime value of these animals as a non-consumptive resource (Vianna et al. 2010).

6.3.3 Regulatory Frameworks

In recent years, PICTs have started to enact or strengthen legislation surrounding marine and coastal resources. Nevertheless, there is also a need at the regional level, under the United Nations Law of the Sea Convention (UNCLOS), for PICTs to have integrated management plans, while still respecting sovereign rights, to increase the benefits for Pacific Islanders. Some Pacific regional initiatives have been adopted. For example, the Cleaner Pacific 2025—Pacific Regional Waste and Pollution Management Strategy 2016–2025 is a comprehensive regional framework for sustainable waste management and pollution prevention in the Pacific region (Parkinson 2020). The Secretariat of the Pacific Regional Environment Program (SPREP) also produced the Pacific Marine Action Plan: Marine Litter 2018–2025, as part of the Regional Seas Programme and the Global Partnership on Marine Litter (SPREP 2018). This Plan sets out the policy context and key actions and activities to minimize marine litter across the PICTs, including terrestrial-based marine litter point sources. Other international legislation and regulatory frameworks that apply to the blue economy and indirectly to tourism include the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the IUCN Red List of Threatened Species, and the Convention on the Conservation of Migratory Species of Wild Animals.

In May 2020, Fiji provided a working draft of its first National Ocean Policy and enshrined it in law in 2021. The vision of the National Ocean Policy is to provide for "a healthy ocean that sustains the livelihoods and aspirations of current and future generations of Fiji" while the mission of the Policy is "to secure and sustainably manage all of Fiji's ocean and marine resources" (Republic of Fiji 2021). The policy recognizes that Fiji has large areas of ocean and marine resources that it

has both rights to use, but also responsibility to manage (Sloan et al. 2020). These ocean areas accommodate numerous and sometimes competing uses and may be adversely impacted by a range of development activities that are regulated by different government ministries or departments. One of the goals of the National Ocean Policy is to create the foundation for Fiji's blue economy by outlining how its resources will directly benefit its citizens in terms of both direct and indirect economic benefits, support other industries including tourism and safeguard or provide for cultural knowledge, food security, border security and how it will deal with and adapt to threats like climate change (Sloan et al. 2020).

For some time, Fiji citizens have made a voluntary pledge not to eat Grouper and Coral Trout during peak breeding season. In 2018, Fiji's Ministry of Fisheries made this a legal ban in this breeding season. However, with the onset of COVID-19, this ban was removed due to concerns about residents having access to food during the pandemic. Nevertheless, seasonal bans and species restrictions remain an important management tool from a fisheries management perspective to enable the recovery of stocks of certain fish. This management tool has been used globally to manage both fish and game species and ideally should be based on knowledge of the breeding patterns of the species that are being managed (Sloan and Samuela 2020).

Environmental lawyers have urged Tuvalu to develop a national ocean policy along the lines of the Fiji version which aims to implement a shared vision for its ocean areas and resources. Given the importance of the ocean and its resources for Tuvalu, there is a need to protect and sustainably manage this natural resource in an integrated way (Pelesala et al. 2020). While the landmass of Tuvalu is just 26 km^2, its ocean resources (EEZ) are 717.8 km^2. A good ocean policy provides a framework for sustainable development, management, and conservation of oceans resources and their habitats. Developing a national ocean policy would need buy-in from a wide range of stakeholders. The policy would also need to link with existing laws and governance frameworks, such as the Marine Resources Act (2006), Fisheries (VMS) Regulations (2000), Conservation and Management Measures Regulations (2009), and the Maritime Zone Act (2012), among others. Further, a national ocean policy would also need to recognize the different responsibilities of different government ministries. For example, the Ministry of Fisheries and Trade looks after fisheries, maritime boundaries, and ocean areas; the Ministry of Foreign Affairs is responsible for the marine environment, climate change, sea patrols, and international ocean forums, while the Ministry of Transport, Energy, and Tourism is responsible for shipping, ports and marine cables (Pelesala et al. 2020).

In 2021 the South Pacific Tourism Organisation finalized its Pacific 2030 Sustainable Tourism Policy Framework, which sets out the vision, policies, and actions needed to transform tourism to make it more sustainable and provide greater benefits to the communities of the Pacific (SPTO 2021). The framework aims to support prosperous and resilient economies, empower communities, amplify and promote culture, accelerate climate action, protect ecosystems, and build resilience.

Several PICTs have produced National Tourism Development plans. The focus of many of these plans is on increasing the economic benefits of tourism to PICTs. The

emphasis tends to be on increasing international tourist arrivals, destination awareness, and tourism product development. For example, the Solomon Islands National Tourism Development Strategy 2015–2019 emphasizes five areas: (1) marketing and research; (2) transport and infrastructure; (3) product development and investment; (4) human resource development; and (5) cruise shipping and yachting (Solomon Islands Government, 2015). The Vanuatu Tourism Action Plan 2014–2018 acts as a guideline to facilitate development in the tourism industry by "Doing the Basics Better". The five key priorities areas of this plan are (1) deliver tourism benefits to the outer islands; (2) focus all key marketing efforts on core markets; (3) invest in planning and building infrastructure that will benefit tourism; (4) address the expectations of the tourism markets; and (5) work effectively and with clarity on who does what for Vanuatu tourism (Vanuatu Ministry for Tourism Industry and Commerce & Ni-Vanuatu Business 2013).

Fiji has had a long tradition of producing tourism development plans. The earlier plans almost predominantly focused on marketing, such as the Fiji Visitors Bureau Strategic Plan 1989–1991 to the Fiji Tourism Development Plan 1998–2001, Fiji Tourism Development Plan 2007–2016, and the most recent Fiji Tourism Development Plan 2021 (Fiji Ministry for Industry Trade and Tourism 2019). These national tourism development plans tend to mention sustainability throughout the document, yet the key performance indicators all relate to economic growth, improved business success, and destination marketing. The SPTO Pacific 2030 Sustainable Tourism Policy Framework differs in this regard in that there is a better balance between economic viability and the environment and society and culture.

At a micro-level, for the most part, it is left up to tourism operators to self-regulate. For example, Pratt and Suntikul (2016) note that one dolphin-watching operator in Fiji follows the precautionary principle. Following the guidelines of SPREP (2008), this operator insisted that tourists should not feed the dolphins and the captains do not allow any swimming with the dolphins. The captains of the dolphin-watching vessels have been instructed not to make sudden or repeated changes in the direction or speed of the boat; not to chase, encircle or block the path of the dolphins or separate a group of dolphins.

Often, there is legislation in place to protect the environment, but Pacific Island governments have few resources available for effective monitoring and evaluation. Yet, the Pacific Islands are starting to get serious about corporations that damage the environment through tourism development. In a landmark case starting in 2019, after the New Zealand media and then Australian media highlighted environmental damage created by a foreign resort developer on Malolo Island, Fiji, the Fiji Government took the developer to court. Freesoul Real Estate Development Limited was found guilty of two counts of undertaking unauthorized developments in Malolo (Fiji Village 2021). The developers started construction on a 350-room resort without the required permits, destroying the local fishing grounds and mangroves, which will cost millions of dollars to restore (Newsroom 2019). At the time of writing, sentencing is yet to take place, but under the Environment Management Act 2005, the company and its directors face fines of up to FJ$ 750,000 (approximately US$ 360,000) a term of imprisonment of up to 10 years, or both (Fiji Village 2021).

The Pacific is particularly vulnerable to the impacts of climate change (Becken and Hay 2007). While out of the control of Pacific Island governments, they can try to reduce their vulnerability and adapt to climate change. Klint et al. (2015) discuss the interactions that effects of climate change—such as sea level rises, beach erosion, and increases in the intensity and frequency of extreme weather events—have on tourism in the Pacific. Using Kiribati, Samoa, and Vanuatu as examples, Klint et al. (2015) recommended possible adaption measures such as protection of coastal areas, desalination plants, and rainwater tanks; relocation of tourism infrastructure; adoption of stricter building standards; and diversifying tourism markets to a broad range of tourism products. In the aftermath of the 2009 tsunami in Samoa, Jiang et al. (2015) documented a community perspective to understand the resilience of those involved in the Samoan tourism industry in light of its vulnerability to climate change. With a spotlight on Vanuatu, McNamara et al. (2020) highlight several adaptive initiatives taken by the local communities who are dependent on tourism, fishing, and agriculture to combat the effects of climate change. Examples of these adaptation projects include construction of a sea wall along the coastline to adapt to the climate change risks of storm surges, erosion, cyclones, and drought and protection of coral ecosystems through training and the creation of incentives around crown-of-thorns starfish control.

6.3.4 Tourism Impacts and Mitigation

While much of the academic literature on the impacts of tourism has been quite broad and focused more on both the economic impacts and socio-cultural impacts, several studies have explored the nexus between tourism and the environment. Sykes and Reddy (2009) demonstrated that over 10 years from 1998, a small indigenous community in Fiji established a community-managed Marine Protected Area. Biological surveys and socioeconomic assessments were implemented annually. The results showed increased fish populations within the MPA after three years and increased invertebrate populations after five years. Despite some poaching still occurring inside the MPA, it did not significantly impact the overall populations, suggesting ecosystem resilience. A small coral restoration project is thriving inside the MPA. The MPA had economic and social importance to the local community and due to conservation of the MPA, healthy coral and fish stocks enabled the community to generate income through ecotourism activities.

Recognizing that the marine environment is vital for Fiji's tourism sector, Mangubhai et al. (2020) explore the extent and scale to which "Marine Conservation Agreements" (MCAs) between tourism operators and indigenous, resource owning communities are used in Fiji, and their contribution to biodiversity conservation and fisheries management. Collecting data from March to October 2017, Mangubhai et al. (2020) found that 56 of the 81 (69.1%) tourism operators surveyed had been involved, were involved, or were becoming involved in some form of MCA. All operators were using MCAs as a tool to establish some type of MPA (e.g., marine spatial

closure) within the traditional fishing grounds of indigenous Fijian communities (Mangubhai et al. 2020). Almost half (48%) of the MCAs were simple "no-fishing" MPA agreements, while the other half (52%) had additional bans on reef walking, shell collecting, and/or the use of motorized water sports. Almost half of these tourism businesses (45%) implemented reef enhancement projects such as coral planting and giant clam restocking while over a third (36%) organised the removal of predatory crown-of-thorns starfish when outbreaks occurred.

Realizing the importance of nature-based marine tourism and the uniqueness of shark dives as a tourism experience, Ward-Paige et al. (2020) took a five-year snapshot of Fiji's shark population that may be used to further evaluate and compare future shark populations. In Fiji, also four in five (78% or approximately 49,000) divers are engaged in shark diving each year (Vianna et al. 2010). In 2012, Ward-Paige et al. (2020) worked with 39 dive operators in collaboration with eOceans to start the Great Fiji Shark Count to document sharks (and other species) on 592 dive sites. Eleven shark species were identified from 30,668 dives. The results can be used to guide future scientific research and provide a baseline for future assessments. The studies cited above are examples of how scientific studies can direct policy decisions and better inform tourism operators to be more sustainable. They provide the information needed to make science-based decisions.

Two Pacific SIDS, Fiji and Palau, have recently introduced new taxes aimed at protecting the physical environment. Fiji's Environment and Climate Adaptation Levy (ECAL) is a tax on prescribed services, items, and income. The ECAL funds collected as of 30 April 2018 totaled FJ$ 110.6 million (USD ~52 M), of which FJ$ 106 million (USD ~50 M) had been spent.

The ECAL is levied on different sectors of the tourism industry, from eating places to accommodation and activities providers (Table 6.4). The tax is essentially a tax on the tourism industry. Almost 94% of the ECAL tax revenues are derived from the tax on prescribed services. The prescribed services levied with this 10% tax are the ones offered from the following businesses: licensed hotels, inbound tour operators, licensed bars, tourist vessels operating within Fiji waters, licensed nightclubs, organizers of entertainment programs/product exhibitions, recreational activity operators, cinema operators, licensed rental/hire car operators, bistros and coffee shops, licensed restaurants, aircraft operators, water sports operators, homestay operators, unlicensed service operators.

Sixty percent of the tax revenues are spent on infrastructure development and a further 27.5% is spent on rehabilitation after Tropical Cyclone Winston. Little or none of the tax revenues imposed on the tourism industry are focused directly on sustainable tourism development (or research related to tourism impacts). Under the categories of sustainable resource management, there are several relatively low-value projects such as coastal fisheries development, aquaculture development, food security program (aquaculture), reducing emissions from deforestation and forest degradation, research and development of wood and non-wood species, reforestation of degraded forest and reforestation of indigenous species. Under the category of energy conservation, there are allocations for renewable energy development projects

Table 6.4 Environment and Climate Adaptation Levy (ECAL) Utilization by Thematic Areas (ECAL in Action, Fiji Government https://www.fiji.gov.fj/getattachment/e71b8d61-ce72-48fc-bca2-eeeff2d8739b/Environment-Climate-Adaptation-Levy.aspx)

Infrastructure development	60.0%
Tropical cyclone winston rehabilitation	27.5%
Agricultural development	5.0%
Sustainable resource management	2.0%
Disaster relief and response	1.0%
Meteorology services	1.0%
Rural development	1.0%
Urban development	1.0%
Energy conservation	1.0%
Environmental conservation	0.5%

and supply, installation, and upgrades of solar home systems. These projects are only indirectly related to tourism.

Effective January 1, 2018, Palau has legislated a Pristine Paradise Environmental Fee (PPEF). A fee of US$ 100 is included in the price of every international airline ticket into Palau (Palau Customs 2018). The ticketing airline is responsible for collecting the PPEF. Palauan passport holders are exempt. The PPEF will be used to finance the Palau National Marine Sanctuary (Kesolei 2018). The objective of the tax is to protect the marine sanctuary by preserving 80% (500,238 sq. km) of Palau's Exclusive Economic Zone as the Palau National Marine Sanctuary. The remaining 20% (85,896 sq. km) will serve as a domestic fishing zone.

Compared to Fiji's ECAL, Palau's PPEF will be directly spent on either tourism operations, such as the International Airport or the environment (Protected Are Network or Fisheries Protection Trust Fund). Only a smaller share goes to a general fund (National Treasury and State Governments).

6.4 Discussion

Marine tourism has existed in some form for over one thousand years or more, but became pronounced as Europeans began to pursue coastal recreational activities in the Eighteenth Century (Orams 2002 and references therein). The advent of SCUBA diving, recreational vessels, transportation, and technological growth made access to coastal areas a sought-after attraction for diverse tourists, not just the wealthy (Orams 2002).

Wildlife tourism, especially whale watching, has become a significant and profitable attraction globally and by far the most prominent component of marine tourism (Hoyt 2001; O'Connor et al. 2009). For example, in 2008, the International Fund for Animal Welfare reported that 13 million people from 119 countries and territories engaged in whale-watching activities, amounting to a total expense of USD 2.1

billion (O'Connor et al. 2009). In fewer than one hundred years, humans have transitioned from hunting and killing whales to watching whales, starting in Hawai'i in 1979 (Forestell and Kaufman 1990; Cisneros-Montemayor et al. 2010; Cunningham et al. 2012).

Tourism activities are viewed as a benign substitute to the invasive and extractive whaling, fishing, mining, and oil and gas industries (Bearzi 2017). Yet, for more than two decades (Forestell and Kaufman 1990; IWC 1996; Corkeron 2004; Constantine and Bejder 2008; Christiansen and Lusseau 2015; Machernis et al. 2018), several short- and long-term studies have recorded that uncontrolled whale watching (a collective term for whale, dolphin, and porpoise viewing and swim-with-animal operations) can induce negative behavioral and population-level changes in exposed animals. Constantine and Bejder (2008) argued that the burden of proof must shift from scientists and conservationists to industry, such that the tourism industry would need to substantiate the lack of biological impacts on the species or habitat from whale watching operations. But in smaller nations, and island countries with a less industrialized tourism sector, shifting responsibilities are alone insufficient because of the lack of infrastructure, scientific and resource support, as well as an abdication of safety norms in these regions like the ecotourism issues highlighted by Pasape and Mujwiga (2017) in Tanzania.

Despite the enthusiasm and economic capital for marine tourism, the lack of capacity and support for local tour operators can hamper the ability to assess and mitigate tourism impacts without compromising livelihoods. This is evident in Mauritius and some PICT countries. Therefore, in such situations, governments must invest in the science necessary to inform how to adaptively manage various tourism operations. Systems modeling with stakeholder participation (e.g., Bayesian Belief Networks; Meynecke et al. 2017) or participant modeling (PM) approaches are becoming prevalent to help integrate climate change, socio-economics, policies, and ecological impacts in designing the appropriate management scheme for a specific region (Hedelin et al. 2021). But PM approaches must be preceded by committed investments in comprehensive baseline data collection regarding the area, timing, number, and types of legal and non-legitimate tourism activities in an area.

Tour operators can be excellent citizen scientists with the appropriate training, scientific collaboration, and resources (e.g., GPS, electronic tablets to record data, digital SLR cameras, hydrophones, drones, GoPro underwater cameras). Scientific data collection during tour operations adds tremendous value to rapidly assess seasonal and inter-annual changes in habitat or species behavior, even with the inherent biases in the sampling protocol. Tour operations can generate vast amounts of continuous data that span a full year or season, and across multiple years. Despite many studies that have leveraged platforms of opportunity (POPs), citizen science remains an underutilized resource in the marine and coastal sciences (Roy et al. 2012). Some examples include using POP data in Alaska to study killer whale predation of beluga whales (Shelden et al. 2003), behavioral assessment of common dolphins in Hauraki Gulf, New Zealand (Stockin et al. 2009), bull shark associations at a dive feeding site in Fiji (Bouveroux et al. 2021), and occurrence of rare/endemic corals and reef fishes in Mauritius (McClanahan et al. 2021). Moreover, citizen science

can be a huge benefit to marine conservation and allow the public and businesses to serve as environmental stewards and yield societal benefits, including economic gain (Cigliano et al. 2015). Basic longitudinal data collection on marine species occurrence, geospatial information, and behavioral responses to different human-caused stressors should remain the overarching goal. Data collection does not have to be complicated or involve technologically advanced monitoring systems.

Researchers and citizen scientists are encouraged to establish systematic and continuous data collection programs that allow scientists and managers to understand spatiotemporal patterns and trends in abundance, species richness and diversity, distribution, and acute and chronic responses to environmental disturbance that may synergistically or cumulatively affect essential habitat or species population viability.

In small island nations with ocean-dependent economies, it is important that local tour operators have the means to override systemic upheavals or variable tourism demands and are trained and informed environmental stewards. Also, governments should avoid relying exclusively on international scientists and organizations for scientific support and environmental protection. Instead, governments and other authorized agencies, should promote an environment that emboldens the local and independent community of scientists, managers, and stakeholders to create bottom-up co-management conservation models, build local scientific capacity, and oversee scientific studies and implementation of research recommendations. Such an approach does not discount foreign financial support, training, and co-production of data that must happen with experts and invested environmental organizations.

In general, for drastic shifts in tourism management practices to occur, collectively we need to accept that tourism activities are not "benign" and treat them like any other environmental stressor. Such activities need to be managed in the context of other exploitative marine industry practices and appropriate limits imposed through a proper compliance framework. Like any marine industry activity (fish farming, renewable energy development, defense), the first step is to collect scientific evidence to characterize the threat and impacts on marine species and affected habitats, and then adopt and implement an adaptive management framework to modulate activities based on newer data, changing environmental conditions, or animal status at different planning and policy levels and scales (Higham et al. 2009). Higham et al. (2016) similarly argued that tourism should be viewed and managed as a non-lethal consumptive activity, which results in sub-lethal anthropogenic and energetic stress. The treatment of tourism activities as a stressor is an essential step for international, national, and local governing entities to design and construct the appropriate regulatory, management, and scientific models, regardless of a small or big nation status.

The case studies discussed here highlight similarities and disparities across the ocean divide and the struggles to achieve the blue economy dream. At the same time, small island nations benefit and suffer because of their bountiful ocean. Tourism numbers alone reflect the immense attractiveness of small island nations to the global tourist. The rich biodiversity, less-trodden paths, and beautiful seascapes fulfill a tourist's expectation of wanderlust. But the socio-cultural norms, geopolitics

(including colonial ties), and foreign investments lead to contrasting styles in marine tourism management and governance. Myopic legislation, multiple ministries with fragmented and sometimes conflicting jurisdictions, and regulations with little or no enforcement is an oft-repeated complaint. The flood of tourism arrivals in places like Mauritius are not supported by concomitant evaluation of the tourism carrying capacity and their effects on trust resources. Overall, there is inadequate recognition that ocean resources are not static and self-replenishing.

Moreover, there is no apportionment of tourism revenue and any associated fees levied by different countries towards science. Science appears to be divorced from tourism management and sustainability rather than a necessity to comprehensively manage tourism impacts. Tourism is irrevocably linked to other marine industries that includes artisanal and commercial fishing operations, oil and gas, shipping, mineral extraction, defense, coastal development, as well as climate change mitigation projects. The adverse effects from these marine users may be compounded by tourism ventures, which overburden a system already irreparably damaged by one or another industry. Thus, ocean resource use planning needs to account for interactive stressor effects on the marine ecosystem and evaluate human impacts holistically rather than sectionally as has being recognized in the Caribbean and Mediterranean regions (CARSEA 2007; Plan Bleu 2014).

Governments and tour operators need to realize that tourism ventures can be drastically cut short due to shifting species distributions, localized population declines or due to global climate change, pandemics, and human-caused perturbations (Higham and Lusseau, 2007; Shelton and McKinley 2007; Higham et al. 2009). The recent oil spill in Mauritius laid bare the consequences of environmental disturbance and the capricious nature of tourism. A thriving dolphin tour industry in Mauritius was forced into closure due to the COVID-19 pandemic, leaving many operators hopelessly searching for alternate occupations. Short-term financial support may help to tide over tourism business operators during desperate times, but it is not a viable solution when tourism operations are likely to be constantly threatened by unpredictable and insurmountable events.

The effects of the oil spill in Mauritius were compounded by the unfavorable location of the spill and an already reeling tourism economy due to the global COVID-19 pandemic. In effect, these events revealed the impermanence of marine tourism that rely on mobile species, pristine habitats, or vulnerable ecosystems. To be agile, an alternate management scheme must be pursued that is resilient to fluctuating markets and environmental change, both human-caused and natural. The suggestions offered here are not new (Higham et al. 2009, 2016), but reinforcing these ideas is important to help revitalize existing tourism models and change mindsets.

A touted measure to promote marine conservation is the creation of Marine Protected Areas (MPAs) (Ban et al. 2012; IUCN 2018). However, the failure or success of MPAs depend largely on the management scheme and local circumstances (Pendleton et al. 2018). Although many governments are tempted into setting up as many MPAs as they can, the effectiveness of these MPAs are irregular. In fact, establishing MPAs does not guarantee marine ecosystem impregnability. Local cultures, stakeholder engagement, economic and education status, livelihood-augmenting

schemes, regulatory systems, and ecology are all factors that can derail management of an MPA (Chaigneau and Brown 2016; Pham-Do and Pham 2020). There is no one tourism management system that will work without trial, testing, and modification (Giakoumi et al. 2018). To that end, we provide a list of recommended actions that may fortify existing schemes and allow incremental improvements in tourism governance, especially in small island nations to someday attain the blue economy promise (Box 6.1).

Box 6.1 Recommendations for Realizing the Promise of a Blue Economy in Small Island Nations

Apportion tourism fees and taxes to investigate and monitor impacts from tourism activities and other synergistic stressors.

With scientific rigor, conduct environmental impact assessments of tourism activities to determine which tourism activities are sustainable and which are not in the interest of maintaining healthy and vibrant ecosystems.

Acknowledge that uncontrolled tourism is a sub-lethal stressor comparable to other human disturbance or destructive activities and therefore, subject to impact-dependent mitigation and monitoring requirements.

Implement holistic ocean resource management that evaluate human stressors effects in totality to inform concrete management and conservation solutions and prioritization of ocean space use, wherein, coastal, and marine tourism activities are not treated in isolation.

Establish Marine Protected Areas (MPAs) as test beds for experimentation and evaluation with stakeholder engagement and compare it to control sites with no protections before officially declaring MPAs. The creation and elimination of MPAs can be an adaptive process informed by cost-benefit analysis within and outside MPAs. MPAs need not be a permanent or only solution.

Promote and encourage community-led conservation practices and transmission of local ecological knowledge.

Invest in tourist education and outreach programs. Tour operations must have an educational component to them (see Cheung et al. 2020).

Frequently train (on a prescribed schedule) tour operators on regulations, guidelines, and scientific data collection. An informed and environmentally aware tour operator will ensure safeguards are in place and will be an effective environmental steward.

Limit the number of permits awarded to tour operators and establish conditional permit renewals based on performance evaluations. Both quality and quantity matter in limiting tourism impacts on marine ecosystems.

Invest in tourism infrastructure, tour operator safety, and access to diverse tourism initiatives that are resilient to economic or environmental turmoil.

Build local science capacity to enable the rise of the next generation of scientists and ocean leaders from the community and collaborate with regional

and international scientists in the co-production of ocean observation and other ecological, economic, or human dimensions data.

Run public-awareness campaigns about sustainable tourism practices and the importance of valuing and protecting marine life and the broader ecosystem for societal health and economic growth.

Enforce guidelines and regulations. Temporarily exclude from area or activities or collect fines from tourists and tour operators for flouting rules. Consider permanent suspensions of permits or licenses if there is a pattern of negligence.

Disclaimer The scientific results and conclusions, as well as any views or opinions expressed herein, are those of the author M. Srinivasan and do not necessarily reflect those of NOAA or the Department of Commerce.

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