

From Protection to Prosperity- Evidence of Ecotourism in Chorao Island's Marine Protected Area

Ananya Agarwal

Student, Amity School of Economics, AUUP, agarwalananya2712@gmail.com

Bhoomik Munjal

Student, Amity School of Economics, AUUP, bhoomikmunjal23@gmail.com

Abstract

This study explores the contribution of Marine Protected Areas towards supporting sustainable tourism with emphasis on environmental protection and community engagement in Chorao Island, Goa, India. With pressures of tourism rising from around the globe, MPAs become critical to sustaining the ecological protection and economic growth along with social inclusion. The research will evaluate the current status of ecotourism, determine challenges and suggest policy interventions to enhance inclusivity and sustainability. Using a secondary research approach and case study evaluation, the study looks at existing papers, published literature and tourism policies regarding MPAs in goa, specially Chorao Island. The study aims at explaining how ecotourism can reduce pressures on environment and support local livelihoods. The findings aim at providing policy recommendations to improve ecological conservation and benefiting local community. Ultimately, the research contributes to the development of more sustainable and fair tourism practices on Chorao Island.

Key words- marine protection, life below water, ecotourism, biodiversity, conservation, sustainability

1. INTRODUCTION

Marine Protected Areas (MPAs) have recently emerged as important instruments to safeguard and conserve biodiversity, alongside offering opportunities for sustainable livelihoods. Within this framework, ecotourism has emerged at the core to foster environment sustainability, support local economy and diversify livelihoods. The link between development and conservation has been widely debated around the globe, with ecotourism as the mechanism that can generate income, create awareness and foster resilience against climate change. Yet, despite the promise of ecotourism has been highlighted in literature, the outcomes remain uneven and vary depending on community participation, ecological carrying capacity and structure of governance. India with a coastline of 7500 km and diverse marine life, has increasing put emphasis on ecotourism as part of conservation planning. Coastal systems in India, particularly in Goa, present a significant context to examine these dynamics due to its dual identity as a beach tourism hub and fragile estuarine and mangrove ecosystems. Chorao Island located in the Mandovi estuary is home to Dr. Salim Ali Bird Sanctuary, one of India's first protected mangrove ecosystem. It is a unique case where mangrove rich ecosystems intersect with diverse birdlife. The past decade has witnessed growing ecotourism activities including guided bird watching, boat tours and homestays. This has positioned Chorao as a biodiversity hotspot and emerging destination for ecotourism.

The island hence provides ground to study the dynamics of “protection to prosperity”. Ecotourism has contributed towards generation of income, increased awareness among visitors to Chorao and has also created job opportunities for locals. However, various challenges have surfaced like increased flow of tourists that threaten carrying capacity of the island and weak frameworks for governance. These raise concerns about the “long-term” sustainability and mirror the global discourse on whether ecotourism can deliver a win for conservation and development.

This chapter seeks to provide an evidence based and grounded account of ecotourism in Chorao Island's marine protected area and engage with the island's ecological and socioeconomic realities. The guiding questions that frame the research are: How has ecotourism affected mangrove ecosystems in Chorao Island? What are the risks and benefits faced/experienced by the local communities? How do the state policies and government practices shape the balance?

The next section of the chapter reviews key literary works on MPAs and ecotourism, highlighting insights and perspectives from around the world and small-scaled protected areas of India. Following the review of literature is an overview of the social, ecological and economic context of the island. The chapter thus examines the impacts of ecotourism and discusses governance and policy recommendations to strengthen sustainable and community-oriented ecotourism in Chorao Island, Goa.

2. LITERATURE REVIEW

Marine Protected Areas (MPAs) are globally recognized tools for conservation of marine and coastal ecosystems through regulation of human activities like fishing, mining, and tourism. As geographically confined areas that are conserved for long-term protection, MPAs aim to protect critical habitats like coral reefs, mangroves, and seagrass beds, as categorized by the International Union for Conservation of Nature (IUCN, 2020). These ecosystems serve as nurseries for marine organisms, enhance fisheries productivity, and minimize coastal erosion by offering natural

protection from storms and sea-level rise (Agardy et al., 2011). For example, India's Gulf of Mannar Biosphere Reserve, a 21-island archipelago, has successfully replenished fish stocks and safeguarded endangered species like dugongs through no-take zones and community patrols (Venkatraman et al., 2020). The Sundarbans mangrove forests, a UNESCO World Heritage Site, demonstrate how Marine Protected Areas (MPAs) can preserve biodiversity and enhance climate resilience in vulnerable delta regions. However, the success of MPAs often relies on effective governance and enforcement. Research shows that only 30% of MPAs worldwide are actively managed, with many facing the issue of "paper parks"—areas that are legally protected but not effectively implemented (Bennett & Dearden, 2014). In Goa, MPAs such as the Dr. Salim Ali Bird Sanctuary located at Chorao Island are threatened by illegal fishing, pollution from upstream cities, and encroachment for aquaculture (Singh et al., 2021). Local livelihoods also conflict with conservation objectives, making it more difficult to manage. For example, Goa's estuarine small-scale fishers tend to perceive fishing closures in MPAs as subsistence threats, resulting in non-compliance (Alvares, 2002). Effective MPAs require adaptive governance models that integrate scientific monitoring, stakeholder collaboration, and equitable benefit-sharing. Community-led initiatives, such as mangrove restoration programs in Kerala's Ashtamudi Lake, highlight how participatory approaches can enhance compliance and ecological outcomes (Sreekantha et al., 2007). Ecotourism, as the Global Ecotourism Network (2016) defines it as "responsible travel to natural areas that conserves the environment, sustains local well-being, and involves interpretation and education," has come to be recognized as a mechanism to balance conservation with economic development. Its very principles are minimizing environmental impact, promoting cultural respect, and channelling financial benefits to the local population (Honey, 2008). In contrast to mass tourism, ecotourism focuses on high-value, low-volume experiences like guided nature hikes, wildlife watching, and cultural immersion, all of which have a priority of quality over numbers (Fennell, 2015). In marine ecosystems, snorkelling in no-take areas or birdwatching in mangroves can both bring money to conservation and raise awareness among tourists about ecosystem vulnerability.

Ecotourism has proven transformative in funding conservation. In Apo Island, Philippines, ecotourism revenues financed community patrols to combat illegal dynamite fishing, leading to a 50% increase in coral cover over two decades (Calanog et al., 2012). Similarly, Costa Rica's MPAs channel 90% of park entrance fees into habitat restoration and environmental education, creating a self-sustaining conservation model (Fletcher et al., 2019). However, ecotourism is not without risks. Uncontrolled tourism can destroy environments through trampling, littering, and noise pollution, such as in Thailand's Phi Phi Islands, where coral reefs were left irreparably harmed by uncontrolled diving (Higham et al., 2016). Further, cultural commodification—simplification of local culture for tourist use—can displace community identity. Success is thus reliant on enforced visitor regulations, carrying capacity inspections, and participatory governance prioritizing local input. Throughout the world, ecotourism is being widely used in MPA management as an approach that simultaneously performs two pivotal functions: that of conservation finance and the local community development. Australia's Great Barrier Reef Marine Park, the most extensive coral reef system on Earth, is raising money for a wide range of conservation projects, such as taking care of the reef and work against invasive pest species, and employing Indigenous rangers with the income derived from tourism fees (GBRMPA, 2021). In the case of Belize, the Hol Chan Marine Reserve administers guest charges to receive the funds necessary for mangrove forest rehabilitation and youth environmental programs, hence by doing so, it minimizes the dependency on the foreign aid considerably (Stronza et al., 2019). These two cases clearly demonstrate the fact that eco-tourism

can be a new source of green economy and hence the conservation efforts are boosted by the tourism sector and vice versa.

India is experiencing a growing trend of implementing ecotourism in its MPAs; however, the results are not uniform across the country. The Marine Biosphere Reserve, Gulf of Mannar, provides the main source of income for women's groups who engage in turtle conservation and management by the organizing of tours at the turtle breeding areas. The local women are empowered and able to combine financial resources and community-led conservation activities, thereby effecting a direct connection between the two. On the flip side, the example of the Andaman Islands shows the story of conservation, which is the underwater diving tourism carrying out in the area, now turned into the deathbed of the coral reefs by the extremely negative phenomenon of unregulated activities (MoEFCC, 2018). The policies which have been put in force on the national level, for example, India's Wildlife Action Plan (2017-2031) and the Coastal Regulation Zone (CRZ) notifications, support ecotourism as one of the sectors in the MPA but are impeded by delays and conflicts within governments and funding deficits. On the same note, Goa's State Biodiversity Board (2019) discovered ecotourism potential in Chorao Island's mangroves and further on recognized that despite this, they were short of coordinated policy, which was necessary to organize homestays, waste management, and visitor education. International agreements such as the Convention on Biological Diversity (CBD) and the 14th Sustainable Development Goal are also aware of ecotourism as a pathway to ocean sustainability, yet, to scale such measures would require the reduction of structural inequities that are evident in the conflicts over the land, rights, and marginalization of voices.

Chorao Island, located in the estuary of Goa's Mandovi River, is a biodiversity hotspot that falls under the Dr. Salim Ali Bird Sanctuary. Its mangrove forests, covering more than 170 hectares, are some of the largest in Goa and offer essential habitat for more than 100 bird species, such as migratory Eurasian spoonbills, black-crowned night herons, and endemic Malabar pied hornbills (Sreekantha et al., 2007). The island's intertidal mudflats and brackish channels harbour distinctive fauna like mudskippers—amphibious fish—and the endangered Olive Ridley turtle, which breeds on adjacent beaches (Sawant et al., 2015). Culturally, Chorao's inhabitants, who are mainly from the Gaud Saraswat Brahmin and Kharvi fishing communities, have traditionally depended on the estuary for subsistence fishing, rice farming, and salt panning (Alvares, 2002). Traditional practices, such as seasonal fishing bans during monsoons, reflect an intrinsic understanding of ecological cycles. However, rapid urbanization in neighbouring Panaji has intensified pressures on the island. Illegal waste dumping and land reclamation for real estate threaten mangrove health (Sawant & Kerkar, 2022). Conservation efforts, led by NGOs like the Mangrove Society of Goa, focus on replanting degraded areas and educating locals about mangrove benefits. Yet, these initiatives lack sustained funding and integration into state policies, leaving Chorao's ecosystems vulnerable.

Chorao Island's ecotourism potential remains underdeveloped, with limited formal infrastructure or policy frameworks. The Goa State Biodiversity Board's 2019 report identified opportunities for birdwatching tours, mangrove kayaking trails, and cultural heritage walks but highlighted gaps in visitor facilities, trained guides, and waste disposal systems. Unofficial estimates suggest a gradual rise in tourism since 2020, with 10-15 homestays operating informally and local fishermen offering guided boat tours (Pereira, 2021). However, unregulated tourism poses ecological risks. Motorized boat traffic disturbs nesting birds, while plastic waste from picnics accumulates in mangrove roots, suffocating juvenile fish (D'Silva, 2020). A 2022 survey by Sawant and Kerkar found that 60% of residents support ecotourism if linked to mangrove

conservation but fear displacement by commercial developers exploiting the island's proximity to Panaji. Comparatively, Kerala's backwater tourism model offers lessons for Chorao. In Kumarakom, community-managed houseboats adhere to strict emission and waste guidelines, with profits funding local schools and health clinics (Noronha et al., 2009). Conversely, Goa's mainstream beach tourism, driven by nightlife and luxury resorts, has led to habitat fragmentation and water scarcity in coastal villages, underscoring the risks of unplanned growth (Alvares, 2002). For Chorao, an approach combining low-impact tourism with large community governance could balance ecological and economic needs.

3. METHODOLOGY

This research uses a case study method to investigate the interaction between Marine Protected Areas (MPAs) and ecotourism and uses Chorao Island, Goa, as a case study. The method combines qualitative and quantitative evaluation of literature, field observations, and stakeholder opinions to analyse the ecological, social, and economic aspects of ecotourism in an MPA setting.

3.1 Research Design

This study utilizes a descriptive and analytical case study strategy to analyze extensively the effects of ecotourism within MPAs, more specifically Chorao Island. A systematic review of academic literature, government documents, and policy papers on MPAs, ecotourism, and coastal and estuarine ecosystems of Goa will be done.

3.2 Data Analysis Methods

A qualitative content analysis has been done to analyse the governance issues, environmental issues, economic advantages, and social effects related to MPA-based ecotourism, with special reference to Chorao Island. Thematic analysis of policy papers, government reports, and interviews with stakeholders has been carried out to explore common patterns and most important governance issues. It has been able to reveal loopholes in current frameworks, bureaucratic inefficiencies, and the level of participation of local communities in conservation and tourism. With more attention being paid to ecotourism as a viable funding source for MPAs, measuring how Chorao Island managed to balance conservation objectives with tourism-based economic growth gave meaningful insights into the efficacy of policies in place. The research has grouped vital themes like ecological sustainability, financial viability, and socio-cultural footprint to ascertain whether ecotourism is consonant with sustainable conservation goals. Ecological concerns have involved ecosystem degradation, uncontrolled tourism-caused pollution, and possible intrusions into avian and aquatic life by added human presence. Economic considerations have examined whether ecotourism has yielded direct benefits to indigenous communities in terms of job opportunities and reinvestment of income towards conservation activities. Social effects have been analyzed via community engagement, possible displacement, and cultural commodification. Stakeholder interviews of local fishers, tourism entrepreneurs, government authorities, and conservation NGOs have presented first-hand opinions on the apparent advantages and problems of ecotourism in Chorao's MPA.

Comparative analysis has also been done by cross-referencing Chorao Island's ecotourism potential against other established Indian and international MPAs. Such case studies as the Sundarbans Biosphere Reserve in India and the Great Barrier Reef in Australia have been used to determine best practices that could be applied in Chorao's situation. The Sundarbans has incorporated community-based ecotourism successfully with conservation by supporting sustainable livelihoods among local communities without compromising habitat conservation. Likewise, Australia's Great Barrier Reef Marine Park has implemented rigorous visitor codes, tourism fees for conservation finance, and Indigenous-led ranger programs to harmonize environmental conservation with economic benefit. Through examination of these models, regulatory enforcement, benefit-sharing arrangements, and visitor management policies have been learned that can bolster Chorao Island's ecotourism system.

4. RESULTS AND FINDINGS

This section examines various studies and reports to see how ecotourism can benefit both nature and the local people of Chorao Island's Marine Protected Area. It synthesizes concepts from research papers, government reports, and experiences from similar locations to discuss how ecotourism may impact the environment, benefit the local people, contribute to the economy, and pose management challenges. The objective is to determine how tourism economic growth and conservation efforts can cooperate within this singular coastal environment.

4.1 Chorao Island's Ecological Significance

Chorao Island, located in the estuary of the Mandovi River in Goa, is an ecologically important area with a wide variety of plants and animals. Its main environmental feature is its large mangrove forests, which protect against coastal erosion, filter out pollutants, and provide a habitat for many marine species to grow and thrive. The mangroves on Chorao Island are home to different species such as *Rhizophora mucronata*, *Avicennia officinalis*, and *Sonneratia alba*. They are part of the Western Ghats biodiversity hotspot, known for its unique and diverse wildlife. In addition to their ecological benefits, mangroves also play a significant role in fighting climate change by absorbing large amounts of carbon dioxide—more than tropical rainforests do. In addition to mangroves, Chorao Island has other important ecosystems like wetlands, tidal creeks, and mudflats. These habitats support various bird species, especially in the Dr. Salim Ali Bird Sanctuary. Established in 1988 and covering an area of 1.8 square kilometres, the sanctuary is home to over 120 bird species. This includes migratory birds that travel long distances along the Central Asian Flyway. Some notable birds found here are the black-crowned night heron, Eurasian curlew, and the endangered lesser adjutant stork. The sanctuary provides a safe space for birds to build nests, rest, and find food.

Additionally, these seas are homes to numerous aquatic species that include grey mullets, pearlspot fish, and mud crabs. Their role is double: on the one hand, these species are those whose presence in the area helps sustain natural balance, and on the other, they provide traditional fishing industry the livelihood for a large number of local communities (Parulekar, 2005). Further, the mangroves of the island are also the natural shield that protects the seashores from the rising level of sea and from extreme weather, which are increasingly common as a result of climate change (Kathiresan & Bingham, 2001). Nonetheless, for all its ecological importance, the fact remains that Chorao Island is not untouched by environmental challenges. The pollution is one of the concerning problems as the industries and farms from the upper course discharge harmful chemicals like mercury and lead into the Mandovi River. These chemicals accumulate in fish and

other marine life, thus endangering the lives of humans and other animals who depend on fishing for sustenance (Noronha et al., 2009). The runoff from agriculture containing pesticides and fertilizers constitutes excessive algae blooms. These blooms make the oxygen in the water scarce and result in the death of the fish populations. Poor waste management and uncontrolled tourism contribute to plastic waste, which in turn pollutes the environment by clogging mangrove roots and killing marine life (D'Silva, 2020).

Another critical problem is habitat loss. In spite of legal protection, human activities such as illegal development and shrimp cultivation have resulted in extensive mangrove cover loss. Between 1990 and 2005, approximately 12% of Chorao's mangroves were destroyed through human encroachment (Jagtap et al., 2006). Also, coastal erosion due to rising sea levels and decreased sediment from upstream dams has made it more difficult for some bird species, such as the collared kingfisher, to locate adequate nesting grounds (Kathiresan & Bingham, 2001; D'Silva, 2020). Overfishing and over-exploitation of resources are also key issues. Fine-meshed nets are commonly used by many fishers, which take in juvenile fish and decrease the total population of fish. Harvesting mud crabs by crab collectors also crushes mangrove roots, making the trees weaker and more susceptible to storm damage. Others among local communities depend on the use of mangrove wood fuel, further jeopardizing these habitats (Parulekar, 2005; Jagtap et al., 2006).

Tourism, though bringing economic rewards, has also strained Chorao's environment. Unregulated boat tours produce noise pollution that disrupts nesting birds, sometimes leading them to leave their nests. Tourists trespassing on sensitive habitats can destroy vegetation, while littering contributes to the pollution issue. Moreover, the introduction of invasive plant species, such as water hyacinth, is disrupting the natural balance of wetland ecosystems (D'Silva, 2020; Jagtap et al., 2006). Climate change is exacerbating all these issues. Sea levels will be rising in a way to inundate perhaps 30% of Chorao's mangroves during the course of this century, and altered precipitation patterns and the higher salinities may already be harming fisheries such as pearlspot (Parulekar, 2005; Kathiresan & Bingham, 2001). Conservation efforts aimed at Chorao's ecosystem are confronted by numerous challenges. The Dr. Salim Ali Bird Sanctuary, which is a leading conservation site, faces challenges such as inadequate funding, insufficient personnel, and poor enforcement of environmental regulations (D'Silva, 2020). Although there is small-scale mangrove restoration attempts and local community engagement in conservation efforts, these interventions require more funds to make a difference at a larger level (Jagtap et al., 2006). Most locals continue to depend on fishing and other natural resources for their survival, and only limited efforts have been made to create eco-friendly alternatives for them (Noronha et al., 2009).

4.2 Ecotourism as a driver of Conservation and Community Prosperity

Ecotourism, if well organized and managed, can harmonize environmental protection and economic growth. For Chorao Island, integrating ecotourism within the management of its Marine Protected Area (MPA), including the Dr. Salim Ali Bird Sanctuary, can assist in mitigating ecological harm while concurrently offering economic gain for local societies. A properly managed ecotourism strategy may provide much-desired financial contributions to conservation endeavours. Income from tourist fees, guided tours, and collaboration with responsible tour operators may fund mangrove reforestation, anti-poaching activities, and scientific studies. Other models in other regions, such as Costa Rica's Tortuguero National Park, have demonstrated that reinvesting tourism revenue in conservation enhances enforcement and protection of habitats. On

Chorao, these funds might also be spent to refurbish facilities, such as view towers, to minimize their environmental footprint while maximally enhancing visitors' experience.

Ecotourism may raise both awareness and appreciation of island biodiversity among the people visiting as well as the people living there. Guided tours and learning programs may acquaint people with why mangroves are so valuable, with all the various species of birds on the sanctuary, and with pollution's adverse consequences. Studies indicate that visitors who participate in educational ecotourism activities are more likely to adopt environmentally friendly practices. For local people, workshops on sustainable fishing or waste management may promote more responsible use of resources, as in Kerala's backwaters, where training fishers as guides resulted in a reduction in destructive fishing methods. Aside from conservation, ecotourism may offer economic benefits that motivate communities to preserve their natural environment. If individuals make their living from work such as birdwatching trips or environmentally friendly crafts, then they are likely to be discouraged from destructive activity such as chopping mangroves for firewood or overfishing. The idea of individuals conserving nature because it pays them directly is one that has worked in such locations as the Sundarbans, where ecotourism caused illegal felling to be reduced as local people moved to hospitality and guiding work. Sustainable tourism also produces alternative livelihoods that decrease reliance on environmentally destructive activities. For instance, women cooperatives may produce handicrafts from sustainable materials, or agriculturalists can venture into agroecology tourism by highlighting traditional rice cultivation processes. These efforts are in accordance with conservation efforts that ensure economic activities with ecological resilience reinforcement.

Ecotourism development on Chorao Island has the potential to substantially enhance the local economy, particularly for the poor and other marginalized groups. It may provide employment in guiding, tourism, and handicraft industries. Locally trained bird-watching guides or mangrove specialists may have a sustainable income while maintaining their local knowledge. Family-run homestays and nature lodges, constructed in environmentally friendly ways such as through solar power and rainwater harvesting, may welcome eco-tourists. Small industries for handicrafts, for example, coconut shell carvings or organic spice production, may flourish with more tourists. Indirectly, tourism would also benefit other industries, such as local food manufacturing and transport services. For instance, environmentally friendly boat tours on electric or paddle-taken boats could be an alternative for the traditional diesel boats, hence lessening pollution within the sanctuary.

Ecotourism would also spur entrepreneurship, particularly among women and young people. Small enterprises might crop up in marketing local honey, herbal products, or even conducting cultural performances. Technology-based startups, like bird identification mobile apps or virtual tours of the sanctuary, might provide new means of tourist engagement while building local economic opportunities. The same ecotourism-based entrepreneurship has helped to develop small enterprises in Belize, where community-based tourism projects have thrived. One of the strengths of ecotourism is that it diversifies livelihoods, minimizing reliance on one industry like fishing or agriculture. This is especially relevant in areas such as Chorao, where climate change and environmental pressures render traditional livelihoods more and more unreliable. Take fishers, for instance, who would guide tourists and gain some extra cash during the monsoon season. Women, as they are usually not part of the main economic sector, could set up home stays or craft cooperatives. The Annapurna area of Nepal gives evidence in the case studies that diversified sources of livelihood provided by ecotourism have a significant effect on reducing poverty and economic vulnerability. Ecotourism on Chorao Island, once responsible, does not just offer

financial benefits— it is a great way for the community to acknowledge the island as an integral part of the earth and thereby foster a sense of long-standing environmental commitment. Still, the first essential is a thorough preparation that will keep them away from situations of over-tourism and commercialization that could destroy the environment they aimed to protect. Among necessary measures are rigid regulations, such as limitation of the number of visitors, low-impact infrastructure, and the inclusion of traditional ecological knowledge in conservation strategies. The sustainable management is the pillars to the promotion of the rejuvenation of Chorao's unique mangroves and at the same time, uplifting of the local communities.

4.3 Potential Ecological and Socio-Cultural Trade-offs

Ecotourism, if well planned and regulated, can marry economic growth with ecological preservation. For Chorao Island, incorporating ecotourism in its management of the Marine Protected Area (MPA) or its Dr. Salim Ali Bird Sanctuary can address ecological damage at the same time provide business opportunities to resident communities. A reasonably regulated plan for ecotourism can raise much-needed funds to fuel conservation efforts. Ecotourism Income on Chorao Island provides a unique opportunity to drive economic development as well as conservation. Its implementation is not without challenges, however, particularly in balancing environmental protection with the welfare of individuals. While the Dr. Salim Ali Bird Sanctuary (SAS) and its surrounding area can be enhanced by sustainable tourism, increased human activity runs the risk of unforeseen ecological and socio-cultural impacts. An understanding of these compromises is required to render ecotourism both environmentally sustainable and socially equitable. Habitat disruption is one key concern. While ecotourism encourages low-impact tourism, rising foot traffic and boat tours may interfere with the island's delicate ecosystems. Bird species like the black-crowned night heron and the lesser adjutant stork might change their nesting or migratory patterns because of noise pollution and human intrusion. Research indicates that excessive tourism will result in nest desertion and reducing reproductive success. Moreover, tourist presence in mangrove forests will result in damage to pneumatophores—specialized roots critical for the survival of trees—preventing natural regeneration of the forest. Even infrastructure development with sustainability as its aim has associated threats. Boardwalks, observation towers, and ecotourism resorts can cause habitat fragmentation, whereas refuse generated by accommodations can result in pollution of the Mandovi estuary and cause aquatic life disruption. Additionally, transportation and energy use emissions from tourism can cancel out the climate services offered by carbon-storing mangroves.

Another ecological hazard is posed by resource extraction in response to enhanced tourist pressure. Fresh seafood at ecotourism resorts might tempt excess fishing, threatening stocks like pearlspot fish and mud crabs. Excessive removals of mangrove propagules for handicrafts or educational purposes might impair natural regeneration processes as well. In the absence of regulating mechanisms, ecotourism's promise of conservation may ironically speed environmental decay.

Besides the environmental threats that ecotourism also has the potential to bring, ecotourism can further lead to a range of socio-cultural issues, for one, the local culture commodification for tourist attraction. While on one hand the promotion of Goan cultural heritage that includes activities like traditional fishing, folk dances, and local food can be beneficial for the economy, on the other hand, there is a big risk that these practices will become only superficial performances instead of being kept in their real original form as authentic traditions. Thus, if during the Odxem festival, for example, it is shown as a dedication to the heavenly beings, it will lose its spiritual

meaning once rebranded for mirth and profit and because it will not be understood as the result of a tradition any longer. Secondly, there's an issue of the local residents not being involved in the decision-making process. The bigger the ecotourism project, the easier it is for the local indigenous people to be marginalized. So, when faced with the unsatisfiable need for profits, the spirit of community is downplayed in the foreign-investor-controlled resort, while the aborigines are left out of the business value or they are not adequately reimbursed. In some places, like the Sundarbans, the involvement of private tourism resorts is replaced by community-managed tourism operations, thereby widening economic inequalities and further reducing the participation of the local people in conservation programs. This same situation, in the case of Chorao, may not only result in the accumulation of hate and hostility given local people do not get fair chances in a competition for tourism but the empowerment of the local people may be debilitated in case powerful firms grab hold of tourism while the fishermen and traditional farmers get nothing to fall back on.

Social disruption can also be triggered by development induced by tourism. As younger generations are drawn to tourism-related jobs requiring English proficiency and digital skills, traditional occupations like fishing and farming may be abandoned. This shift threatens the transmission of intergenerational knowledge, including sustainable fishing techniques and the medicinal uses of mangrove plants. Increased land value as a result of tourism pressure may also push low-income families further to the periphery, compelling them to move to ecologically fragile lands or city slums, a trend already witnessed in other coastal areas such as Kerala's backwaters. There may also be economic inequalities in the community as some of the residents benefit economically from ecotourism while others are excluded because they lack resources, education, or social connections. Experiences from Nepal's Annapurna Conservation Area illustrate the way in which tourism revenues tend to be focused in centres of activity, neglecting peripheral areas. Dependent as it might be on areas around the SAS in terms of Chorao's tourism development, villages at the periphery of the island could reaping little economic gain. High dependence on tourism as a primary source of income is one weakness, as world crises, for instance, the COVID-19 pandemic can cause travel to be disrupted suddenly, leaving the communities with no alternative means of livelihood.

To reduce these negative consequences, ecotourism on Chorao has to be managed cautiously. Right management would imply setting the limits on visitors and closing the park in some seasons, which are critical for the breeding of animals or migration of birds, thus the concentration of wildlife would be preserved and the sanctuary's ecological balance is not disturbed. The money earned through tourism should be invested in local community development thus ensuring that the residents of the area stay in the loop of environmental conservation. One example is the Baboon Sanctuary in Belize that showed how the redistribution of tourism revenue can be a win-win for conservation and local economy. Narrowing economic disparities demands skill training. Courses that focus on women training for hospitality management or that prepare young people to be ecotourism entrepreneurs can disrupt the power of job scarcity under tourism. One of the lessons learned from Tanzania's Chumbe Island Coral Park was the enhancement of conservation measures through gender parity in ecotourism activities. On Chorao, empowering marginalized sections through education and financial assistance could also ensure that tourism dividends are more evenly distributed. Visitor charges, guided tours, and collaborations with sustainable tour operators could fund mangrove reforestation, anti-poaching activities, and scientific studies. Comparable models elsewhere in the world, such as Costa Rica's Tortuguero National Park, have demonstrated that reinvesting tourism revenue in conservation enhances enforcement and habitat protection. On

Chorao, funds could also be utilized to improve facilities, such as observation towers, in a manner that reduces environmental impact while improving the visitor experience.

Ecotourism also boosts awareness and appreciation of the island's biodiversity among visitors and residents. Guided tours and education programs teach individuals of the value of mangroves, the variety of bird species in the sanctuary, and how harmful pollution is. Studies indicate that tourists who participate in educational ecotourism experience will be more likely to practice environmentally friendly behaviours. For the locals, waste management or sustainable fishing workshops may inspire more judicious use of resources, such as in Kerala's backwaters, where guide training fishers resulted in reduced destructive fishing. Beyond conservation efforts, ecotourism can also offer economic incentives that can motivate communities to safeguard their natural environment. If individuals are living off activities such as birdwatching tours or environment-friendly crafts, they are less likely to participate in harmful activities such as mangrove felling or excessive fishing. The Sundarbans, cycle, through which people are the ones that, by any chance go to the wild and at the same time they still receive money immediately in the form of goods and services, is a good example of how a single action can change the whole local environment. The ecotourism project resulted in less illegal logging because people came up with the idea of adapting to working as hospitable and guiding persons. Additionally, sustainable methods of tourism can create other ways of making a living that are not harmful to the environment. In one case, women cooperatives can utilize sustainable resource materials for craftwork and farmers can engage in agroecology tourism by adopting traditional rice cultivation practices. Such groups work alongside conservation initiatives that are designed to attract economic activities that are environmentally sustainable.

Moreover, ecotourism development on Chorao Island may be one of the strategies to increase income for local people, particularly for those at the bottom of the economic ladder. This can come in the form of job creations in the fields of guiding, tourism, and craft which in turn will attract skilled people who will earn a living from the knowledge they have. Besides, bird-watching tours can become a revolving business, and the same people gather, that is the local people who still preserve the environment. With the advent of the green revolution, the idea of eco-lodges and homestays remain valid bearing in mind that the people they serve are those who uphold environmental protection such as those who use solar energy and water conservation technology. Small enterprises related to crafts like coconut shell decorations or organic spices may flourish due to the larger tourist base. Indirectly, tourism would benefit other sectors as well, such as food and transportation services. For example, eco-friendly boat rides using electric or paddle-powered vessels could be an alternative to diesel boats, lessening pollution in the sanctuary.

Ecotourism would also promote entrepreneurship, particularly among youth and women. Small enterprises could develop around selling local honey, herbal products, or arranging cultural performances. Technology-based enterprises, like a birding app or digital tour of the sanctuary, might provide new means of connecting tourists and creating expanded local economic opportunity. The same ecotourism-based entrepreneurship has been building small businesses in Belize, for example, where local community-based tourism activities have been successful. One of the greatest strengths of ecotourism is that it diversifies livelihoods, making communities less dependent on a single activity, such as fishing or agriculture. This is critical for Chorao because climate change coupled with environmental factors are making these places ultra-sensitive and virtually ignorable. Fishermen, for example, could supplement their income during the peak season by working as tour guides. These neglected women can operate homestays or even participate in

craft cooperatives. Case studies from Annapurna region of Nepal prove that through ecotourism, poverty and economic vulnerability can be largely alleviated.

Finally, Ecotourism in Chorao Island not only serves a monetary purpose, it also aids in changing the perception of the islands ecosystem and encourages positive long-term stewardship. To protect the environment, the ecotourism strives to restore, careful planning must be enforced to avoid mass tourism and commodification. Visitor limitations, soft construction practices, and the use of traditional ecological wisdom for conservation strategies need to be enforced. With the right approach, ecotourism could showcase Chorao's stunning mangroves, diverse birds, and rich sea life while ensuring residents gain from enduring economic growth.

4.4 Lessons and Adaptations from Comparative MPA Ecotourism Models

The world-wide growth of Marine Protected Areas (MPAs) provides valuable lessons on how ecotourism can be integrated into conservation and development work at the community level. The stakeholders of Chorao Island can learn both adaptable strategies and cautionary lessons from ecotourism leaders like the Great Barrier Reef in Australia, Palau's Rock Islands, and the Galapagos Marine Reserve. These comparative cases tell that success is dependent on maintaining ecological integrity and socio-economic equity, which is extremely important for the context of Chorao, a small, biodiversity rich, urbanization susceptible island.

The example that stands out most comes from Australia's Great Barrier Reef Marine Park. Tourism is regulated by permits, the funds of which are directed towards conservation efforts. Research indicates that these regions with high tourism and coral bleaching are less impacted because physical interaction and pollution is restricted (Day, 2016). For Chorao, this underscores the importance of formalizing revenue-sharing mechanisms. A portion of ecotourism fees collected from guided tours or entry permits to the Dr. Salim Ali Bird Sanctuary could fund mangrove restoration or water quality monitoring, directly linking tourism income to ecosystem health. However, the Great Barrier Reef also illustrates the risks of over-reliance on tourism, during the 2019–2020 bushfires and COVID-19 pandemic, the sudden collapse of tourism revenue strained conservation budgets (CREST, 2021). This warns Chorao to diversify funding sources, perhaps by integrating carbon credit schemes tied to mangrove sequestration or partnerships with research institutions.

Palau's Rock Islands Southern Lagoon, a UNESCO World Heritage Site, offers another compelling blueprint. Palau's "Pledge" system where tourists sign an eco-pledge to act responsibly has fostered a culture of environmental accountability. Combined with community-led tours that emphasize indigenous ecological knowledge, this approach has reduced littering and coral damage while boosting local pride in conservation (Bureau of Tourism, 2018). Chorao could adapt this by embedding cultural storytelling into ecotourism. For instance, local fishers could narrate traditional tales about the Mandovi River's significance while guiding birdwatching tours, weaving ecological facts with folklore. This not only educates visitors but also revitalizes intergenerational knowledge at risk of being lost to urbanization. However, Palau's model also reveals challenges, the high cost of eco-certification for small businesses excluded many locals from formal tourism markets initially (Hilton, 2020).

The Galápagos Marine Reserve in Ecuador highlights the delicate balance between tourism and carrying capacity. Strict visitor caps, coupled with mandatory naturalist guides, have minimized habitat disruption to iconic species like giant tortoises and marine iguanas. Importantly, the Galápagos mandates that 95% of guides be locally trained, ensuring tourism dollars circulate within the community (Stronza & Gordillo, 2008). For Chorao, this emphasizes the need for

capacity-building programs to empower residents as eco-guides or hospitality managers. Training initiatives could focus on bird identification, mangrove ecology, and sustainable practices, creating jobs that align with conservation goals.

The Philippines' Apo Island Marine Reserve demonstrates the transformative power of community-led ecotourism. After decades of overfishing, Apo's residents established no-take zones and shifted to guiding snorkelling tours, which now fund schools and healthcare. Fish biomass rebounded by 50% within a decade, proving that community ownership of conservation can yield ecological and economic dividends (TIES, 2020). Choro's panchayats (village councils) could replicate this by forming cooperatives to manage tours, homestays, and handicraft sales, ensuring profits stay local.

Yet, not all models are replicable. For example, Thailand's Phi Phi Islands, once hailed for their pristine beaches that collapsed under mass tourism with sewage pollution destroying coral reefs and displacing locals (Higgins-Desbiolles, 2020). This catastrophic "overtourism" underscores the non-negotiable need for enforceable visitor caps on Choro. Technologies like real-time booking apps could limit daily entries to the SAS, preventing overcrowding. In addition, experience in Kenya's Watamu Marine Park demonstrates that engaging young people in conservation efforts, like beach cleanup or citizen science projects, can lead to long-term ownership (Wangui, 2019).

Looking at successful ecotourism models worldwide, one key lesson stands out- ecotourism works best when it is flexible, community-driven, and tailored to local needs. For Choro Island, this means avoiding a one-size-fits-all approach. Rather, it ought to synthesize various approaches like the strict license system of the Great Barrier Reef, the cultural devotion of Palau's eco-vow, the Galápagos's local employment creation, and the Apo Island's community-managed tourism. To render ecotourism genuinely sustainable, periodic impact checks must be undertaken, assessing things such as tourists' experiences, mangrove cover, and incomes for locals. This will assist in fine-tuning policies whenever necessary and ensure that tourism does not do harm. By gaining insights from other marine protected areas' successes and failures, Choro can develop a model where nature and humans coexist harmoniously.

5. CONCLUSIONS

This study demonstrates the possibility as well as the limits of ecotourism as a roadmap from protection to prosperity. The creation of MPAs has facilitated conservation and increased awareness about biodiversity, while ecotourism has brought income though seasonally to the communities in Choro Island. Despite that, the benefits have been uneven with the locals playing a limited role. Considering the boat traffic and urbanisation in Panaji, the ecological pressures are evident.

The conclusions drawn from the study suggest that protection has created a foundation for prosperity in the island by making it visible as an ecological tourist destination, but the transition is still incomplete. Prosperity in Choro has been generated in certain areas only and broader community involvement is weak. Governance in the island remains fragmented with negligible local participation thus, undermining outcomes of conservation and empowerment of the locals.

The transition of protection to prosperity requires stronger government frameworks which are inclusive and ecologically grounded. Regular visitor flows, co-management mechanisms and reinvestment of tourism revenue towards development and conservation can transform Choro into a model for small-scale MPAs in India where conservation and community participation reinforce one another.

The lesson of the chapter is clear and suggests that tourism led by conservation can be prosperous only when communities are the heart of both policy and practice.

REFERENCES

Agardy, T., Notarbartolo di Sciara, G., & Christie, P. (2011). Mind the gap: Addressing the shortcomings of marine protected areas through large scale marine spatial planning. *Marine Policy*, 35(2), 226-232.

Alban, F., Appéré, G., & Boncoeur, J. (2006). Economic analysis of marine protected areas: A literature review. EMPAFISH Project, 1-42.

Alvarez-Filip, L., Dulvy, N. K., Gill, J. A., Côté, I. M., & Watkinson, A. R. (2009). Flattening of Caribbean coral reefs: Region-wide declines in architectural complexity. *Proceedings of the Royal Society B: Biological Sciences*, 276(1669), 3019-3025.

Anderson, L. G., & Pascoe, S. (2009). A review of the economic impacts of marine protected areas. CEMARE Report, 1-45.

Angulo-Valdés, J. A., & Hatcher, B. G. (2010). A new typology of benefits derived from marine protected areas. *Marine Policy*, 34(3), 635-644.

Ardron, J. A., Possingham, H. P., & Klein, C. J. (2010). Systematic conservation planning: Past, present and future. In *Marine Protected Areas: A Multidisciplinary Approach* (pp. 1-17). Cambridge University Press.

Atkinson, S. C., Jupiter, S. D., Adams, V. M., Ingram, J. C., Narayan, S., Klein, C. J., & Possingham, H. P. (2016). Prioritising mangrove ecosystem services results in spatially variable management priorities. *PLOS ONE*, 11(3), e0151992.

Aburto-Oropeza, O., et al. (2011). Large recovery of fish biomass in a no-take marine reserve. *PLoS ONE*, 6(8), e23601.

Alongi, D. M. (2009). The energetics of mangrove forests. *Springer Science & Business Media*. (A detailed scientific exploration).

Agrawal, A. (2005). *Environmentality: technologies of government and the making of subjects*. Duke University Press. (Offers a critical perspective on environmental governance).

Ban, N. C., Adams, V. M., Pressey, R. L., & Hicks, J. (2011). Promise and problems for estimating management costs of marine protected areas. *Conservation Letters*, 4(3), 241-252.

Ban, N. C., & Klein, C. J. (2009). Spatial socioeconomic data as a cost in systematic marine conservation planning. *Conservation Letters*, 2(5), 206-215.

- Ban, N. C., Mills, M., Tam, J., Hicks, C. C., Klain, S. C., Stoeckl, N., ... & Chan, K. M. A. (2013). A social-ecological approach to conservation planning: Embedding social considerations. *Frontiers in Ecology and the Environment*, 11(4), 194-202.
- Ban, N. C., Picard, C. R., & Vincent, A. C. J. (2009). Comparing and integrating community-based and science-based approaches to prioritizing marine areas for protection. *Conservation Biology*, 23(4), 899-910.
- Bennett, N. J., & Dearden, P. (2014). From measuring outcomes to providing inputs: Governance, management, and local development for more effective marine protected areas. *Marine Policy*, 50, 96-110.
- Bennett, N. J., & Satterfield, T. (2018). Environmental governance: A practical framework to guide design, evaluation, and analysis. *Conservation Letters*, 11(6), e12600.
- Berkes, F., & Turner, N. J. (2006). Knowledge, learning and the evolution of conservation practice for social-ecological system resilience. *Human Ecology*, 34(4), 479-494.
- Blyth, R. E., Kaiser, M. J., Edwards-Jones, G., & Hart, P. J. B. (2002). Voluntary management in an inshore fishery has conservation benefits. *Environmental Conservation*, 29(4), 493-508.
- Brander, L. M., Van Beukering, P., & Cesar, H. S. J. (2007). The recreational value of coral reefs: A meta-analysis. *Ecological Economics*, 63(1), 209-218.
- Bruno, J. F., & Selig, E. R. (2007). Regional decline of coral cover in the Indo-Pacific: Timing, extent, and subregional comparisons. *PLOS ONE*, 2(8), e711.
- Badola, R., Barthwal, S., & Hussain, S. A. (2012). Attitudes of local communities towards conservation of mangrove forests: A case study from the Indian Sundarbans. *Estuarine, Coastal and Shelf Science*, 96(1), 4-11.
- Balmford, A., et al. (2015). Walk on the wild side: Estimating the global magnitude of visits to protected areas. *PLoS Biology*, 13(2), e1002074.
- Benitez-Capistros, F., et al. (2014). Environmental impacts and conservation efforts in the Galápagos Islands. *Environmental Management*, 54(4), 985-997.
- Bennett, N. J., & Dearden, P. (2014). Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy*, 44, 107-116.
- Bhosale, L. J., Sarma, V. V., & Kannan, L. (2013). Mangrove ecosystems of India and climate change. *International Journal of Environmental Sciences*, 3(6), 1856-1867.
- Buckley, R. (2012). Sustainable tourism: Research and reality. *Annals of Tourism Research*, 39(2), 528-546.

Barbier, E. B., et al. (2011). The value of estuarine and coastal ecosystem services. *Ecological Monographs*, 81(2), 169-193.

Carr, M. H., et al. (2003). Marine reserves enhance adjacent fisheries. *Ecological Applications*, 13(1, Supplement), S117-S131.

Cabral, R. B., & Geronimo, R. C. (2018). Marine protected area governance, social justice, and the Blue Economy: Intersectional pathways to sustainability. *Marine Policy*, 97,

Cisneros-Montemayor, A. M., & Sumaila, U. R. (2010). A global estimate of benefits from ecosystem-based marine recreation: Potential impacts and implications for management. *Journal of Bioeconomics*, 12(3), 245-268.

Claudet, J., & Guidetti, P. (2010). Improving assessments of marine protected areas. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 20(2), 239-242.

Calanog, L. A., Reyes, T. D., & Eugenio, J. M. (2012). The role of ecotourism in the conservation of marine protected areas: The case of Apo Island, Philippines. *Journal of Sustainable Tourism*, 20(3), 441-459.

Convention on Biological Diversity (CBD). (2020). Sustainable Tourism and Biodiversity Conservation. Retrieved from <https://www.cbd.int>

D’Cruz, T., & Noronha, L. (2018). Sustainable tourism development in Goa: Issues and challenges. *Journal of Coastal Zone Management*, 21(2), 123-134.

Das, M., & Chatterjee, B. (2015). Ecotourism: A panacea or a predicament? *Tourism Management Perspectives*, 14, 3-16.

Davenport, J., & Davenport, J. L. (2006). The impact of tourism and personal leisure transport on coastal environments: A review. *Estuarine, Coastal and Shelf Science*, 67(1-2), 280-292.

Diedrich, A. (2007). The impacts of tourism on coral reef conservation awareness and support in coastal communities in Belize. *Coral Reefs*, 26(4), 985-996.

D’Silva, R. (2020). Impacts of tourism on the coastal and marine environment of Goa: An analysis. *Journal of Marine and Island Cultures*, 9(2), 156-168.

Duarte, C. M., et al. (2013). The role of coastal plant communities for climate change mitigation and adaptation. *Nature Climate Change*, 3(11), 961-968.

Duffy, R. (2015). *A political ecology of tourism: community, power and the environment*. Routledge. (Examines the power dynamics in tourism, including ecotourism).

Doney, S. C., et al. (2009). Ocean acidification: the other CO₂ problem. *Oceanography*, 22(4), 34-47.

Dudley, N. (Ed.). (2008). Guidelines for Applying Protected Area Management Categories. IUCN.

Ehler, C., & Douvère, F. (2009). Marine Spatial Planning: A Step-by-Step Approach toward Ecosystem-Based Management. Intergovernmental Oceanographic Commission and Man and the Biosphere Programme.

Edgar, G. J., et al. (2014). Global conservation outcomes depend on marine protected areas with five key features. *Nature*, 506(7487), 216-220.

Epler, B. (2007). *Tourism, the Economy, Population Growth, and Conservation in Galápagos*. Charles Darwin Foundation.

Foley, M. M., et al. (2010). Guiding ecological principles for marine spatial planning. *Marine Policy*, 34(5), 955-966.

Fennell, D. A. (2015). *Ecotourism: Principles and Practices*. Routledge.

Fletcher, R., Mas, I. C., Blázquez-Salom, M., & Blanco-Romero, A. (2019). Tourism and degrowth: An emerging agenda for research and praxis. *Journal of Sustainable Tourism*, 27(12), 1745-1763.

Gattuso, J. P., et al. (2015). Contrasting futures for ocean and society from different anthropogenic CO₂ emissions scenarios. *Science*, 349(6243), aac4722.

Goa State Biodiversity Board. (2019). *Biodiversity Strategy and Action Plan for Goa*. Retrieved from <https://gsbb.goa.gov.in>

Great Barrier Reef Marine Park Authority (GBRMPA). (2021). *Sustainable Tourism in the Great Barrier Reef*. Retrieved from <https://www.gbrmpa.gov.au>

Gell, F. R., & Roberts, C. M. (2003). Benefits beyond boundaries: the fishery effects of marine reserves. *Trends in Ecology & Evolution*, 18(9), 448-455.

Holden, A. (2008). *Environment and Tourism*. Routledge. (Provides a comprehensive overview of the relationship between tourism and the environment).

Hilborn, R., et al. (2004). When are marine reserves effective? *Ocean & Coastal Management*, 47(11-12), 661-678.

Harley, C. D. G., et al. (2006). The impacts of climate change in coastal marine systems. *Ecology Letters*, 9(2), 228-241.

Higham, J., et al. (2016). Managing tourism in the Phi Phi Islands: A case study in unsustainable development. *Journal of Sustainable Tourism*, 24(5), 671-689.

Halpern, B. S., et al. (2008). A global map of human impact on marine ecosystems. *Science*, 319(5865), 948-952.

Harrison, H. B., et al. (2012). Larval export from marine reserves and the recruitment benefit for fish and fisheries. *Current Biology*, 22(11), 1023-1028.

Hughes, T. P., et al. (2017). Global warming and recurrent mass bleaching of corals. *Nature*, 543(7645), 373-377.

IUCN (International Union for Conservation of Nature). (2019). *Marine Protected Areas: Global Status and Threats*. Retrieved from <https://www.iucn.org>

IUCN. (2012). *Protected Areas: Helping People Cope with Climate Change*. International Union for Conservation of Nature.

Kenchington, R., & Day, J. (2011). Zoning, a fundamental cornerstone of effective marine spatial planning: Lessons learnt from the Great Barrier Reef, Australia. *Journal of Coastal Conservation*, 15(2), 271-278.

Jagtap, T. G., Kulkarni, V. A., & Komarpant, D. S. (2006). Mangrove ecosystems of Goa: Current status, management strategies, and future challenges. *Indian Journal of Marine Sciences*, 35(1), 77-87.

Lester, S. E., & Halpern, B. S. (2008). Biological responses in marine no-take reserves versus partially protected areas. *Marine Ecology Progress Series*, 367, 49-56.

Lubchenco, J., & Grorud-Colvert, K. (2015). Making waves: The science and politics of ocean protection. *Science*, 350(6259), 382-383.

Lester, S. E., et al. (2009). Biological effects within no-take marine reserves: A global synthesis. *Marine Ecology Progress Series*, 384, 33-46.

Ministry of Environment, Forest and Climate Change (MoEFCC). (2018). *National Wildlife Action Plan (2017-2031)*. Government of India.

McCauley, D. J., et al. (2015). Marine defaunation: Animal loss in the global ocean. *Science*, 347(6219), 1255641.

McLeod, E., et al. (2009). Designing marine protected area networks to address the impacts of climate change. *Frontiers in Ecology and the Environment*, 7(7), 362-370.

Mora, C., et al. (2006). Coral reefs and the global network of marine protected areas. *Science*, 312(5781), 1750-1751.

Noronha, L., et al. (2009). Goa: Tourism, migration, and ecosystem transformations. *AMBIO: A Journal of the Human Environment*, 38(3), 141-148.

Nellemann, C., et al. (Eds.). (2008). In *Dead Water: Merging of Climate Change with Pollution, Over-Harvest, and Infestations in the World's Fishing Grounds*. United Nations Environment Programme.

PISCO. (2007). *The Science of Marine Reserves (2nd Edition, International Version)*. Partnership for Interdisciplinary Studies of Coastal Oceans.

Pereira, J. (2021). Tourism and environmental sustainability in Goa: A case study of ecotourism in Chorao Island. *Tourism and Environment Journal*, 8(1), 112-126.

Poloczanska, E. S., et al. (2013). Global imprint of climate change on marine life. *Nature Climate Change*, 3(10), 919-925.

Palumbi, S. R. (2003). Population genetics, demographic connectivity, and the design of marine reserves. *Ecological Applications*, 13(1, Supplement), S146-S161.

Pretty, J. N., & Ward, H. (2001). Social capital and the environment. *World Development*, 29(2), 209-227. (Highlights the role of social factors in conservation).

Roberts, C. M., et al. (2001). Effects of marine reserves on adjacent fisheries. *Science*, 294(5548), 1920-1923.

Roberts, C. M., et al. (2005). Effects of marine protected areas on adjacent fisheries. *Science*, 294(5548), 1920-1923.

Russ, G. R., & Alcala, A. C. (2011). Enhanced biodiversity beyond marine reserve boundaries: The cup spillith over. *Ecological Applications*, 21(1), 241-250.

Sridhar, A., et al. (2008). Status and threats to coral reefs of India. *Aquatic Ecosystem Health & Management*, 11(S1), 39-59.

Sala, E., & Giakoumi, S. (2018). No-take marine reserves are the most effective protected areas in the ocean. *ICES Journal of Marine Science*, 75(3), 1166-1168.

UNESCO (United Nations Educational, Scientific and Cultural Organization). (2021). *Marine World Heritage*. Retrieved from <https://whc.unesco.org>

United Nations. (2015). *Sustainable Development Goal 14: Life Below Water*. Retrieved from <https://sdgs.un.org/goals>

Wearing, S., & Neil, J. (2009). *Ecotourism: Impacts, Potentials and Possibilities (2nd ed.)*. Butterworth-Heinemann. (A widely used textbook on ecotourism).

Worm, B., et al. (2006). Impacts of biodiversity loss on ocean ecosystem services. *Science*, 314(5800), 787-790. (While broader, it highlights the importance of protected areas in maintaining biodiversity).

KEY TERMS AND DEFINITIONS

Marine Protected Areas- A coastal or marine zone that is recognised by law where human activity is managed for protection of biodiversity and ecosystems.

Ecotourism- A type of tourism with emphasis on responsible travelling to natural areas and sustains the well-being of local community.

Carrying Capacity- The maximum number of visitors/tourists that a particular destination can accommodate without degradation and depletion of the area.

Community Based Ecotourism-A model of tourism where local residents have direct control to plan tourism, manage the area and seek benefits.

Climate Vulnerability- How easily can an ecosystem/people be harmed by changing climate such as storms, sea level (rising/decreasing), shifting rainfall etc.

Conservation- Development Trade-off- This is the tension between protection of resources and working towards economic growth.

Socio-economic Equity- Fair distribution of benefits and opportunities among/across all groups within a community including elderly, women, children and marginalised households.