

Chumbe Island Coral Park—governance analysis



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ABSTRACT

Chumbe Island Coral Park Ltd (CHICOP), established in 1991 as the first managed marine park in Tanzania, has become an international test case for sustainable private marine conservation funded by ecotourism. The experiences, problems and achievements of CHICOP are described, in particular drivers and incentives for committed on-site MPA management in the legal and institutional environment of Zanzibar. The employment of local fishers as park rangers proved cost-effective and facilitated partnership with local fishing communities, as did Environmental Education (EE) programs for local schools and communities. Risks for private investors remain high though due to limited long-term security of tenure of leases and contracts.

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1. Introduction

The East African coastal and marine environments suffer from natural and anthropogenic disturbances mainly caused by rapid population growth and widespread poverty. Especially for Tanzania, which has a population of around 43 million (2011 estimate) and a growth rate of 2.9% (2011 estimate). Tanzania is recognized as a Heavily Indebted Poor Country (HIPC) [1] with one of the world's poorest economies [2].

More effective management of the coastal and marine ecosystems is required to improve people's livelihoods, sustain national economies and to maintain the diversity and productivity of these valuable natural resources [3]. In Tanzania, MPAs and their management effectiveness are recent concepts. The MPAs gazetted from the mid 1990s have insufficient staffing and budget, and only few have more recently developed management plans. Therefore, the nation is still far from meeting its commitment of protecting 10% of the marine ecological regions by 2012 [4].

From 1991 to 1994, Chumbe Island Coral Park Limited (CHICOP) successfully negotiated with the semi-autonomous government of Zanzibar that the western coral reef and all forest cover of Chumbe Island should be gazetted as a MPA. This MPA would be managed by CHICOP, a limited company established for that purpose, becoming the first managed marine park in Tanzania and what is considered to be the first private MPA in the world.

Ecotourism operations started in 1998. The intention was to develop a financially sustainable model of MPA management through revenue generated from ecotourism, and the site was chosen for the high biodiversity of the shallow fringing coral reef (ideal for environmental education).

The company objectives are not-for-profit, while operations follow commercial principles and the revenue generated funds all aspects of MPA management, conservation activities and environmental education programs. The Chumbe MPA includes a 33 ha Reef Sanctuary with diverse habitats such as sandy shores, seagrass meadows and a fringing coral reef, and is located on and around the small and formerly uninhabited Chumbe Island that is situated about 6 km west of the larger island of Zanzibar and about 30 km off the coast of Tanzania in East Africa. In addition, the island has a 22 ha Forest Reserve covered with mangrove and tropical dry forest that is also managed by CHICOP.

2. MPA establishment and objectives

Chumbe Island Coral Park (CHICOP) is a privately established and managed island nature reserve recognized by the Zanzibar Government since 1994. The Legal Gazettement order of the Government of Zanzibar (24.12.1994) defines the Reef Sanctuary as a No-Take-Area (NTA) where "No fishing or any extractive use shall be permitted in the area so declared". Such restrictions also apply to research activities. Chumbe is thus classified as a Category II protected area under IUCN's WDPAs listings [5]. Permitted uses of the Chumbe MPA include recreation (swimming, snorkeling, underwater photography), education and non-extractive research activities. In the Articles and Memorandum of Association of CHICOP Ltd the aim for which the company is incorporated is: "To

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Table 1

The current objectives and management actions as established in the revised Management Plan 2006–2016.

Category	Objectives of the Chumbe Island MPA (2006–2016)
Conservation	(1) To protect and manage the marine and forest ecosystems in the MPA (2) To promote research in the MPA in support of management (3) To develop and implement the biodiversity monitoring systems for both the marine and forest habitats in the MPA
Education	(4) To promote the conservation of rare and endemic species (5) To promote environmental education issues regionally (6) To provide environmental education through the Chumbe Education Programme (7) To educate national and international visitors to the MPA
Ecotourism	(8) To manage the Chumbe eco-lodge as a model for sustainable tourism development at the same time as providing a high quality service to visitors (9) To operate the eco-lodge with not-for-profit intentions, whereby revenue generated supports the MPA management and associated activities (10) To promote the eco-lodge nationally and internationally to encourage visitors
Socioeconomic	(11) To encourage benefit streaming from MPA activities to local communities (12) To promote the employment of Zanzibari's from local communities, and to provide on-going training and capacity building for local people. (13) To maintain the sites of historical and cultural importance in the MPA in collaboration with the relevant associated organizations
Management / Governance	(14) To operate in a sustainable, transparent manner, involving all stakeholders (15) To encourage close cooperation between all agencies and to promote good public relations (16) To monitor management performance against planned activities and effectively evaluate the project over time (17) To fulfil all legal and contractual obligations

manage, for conservation purposes, the Chumbe Island Reef Sanctuary and the Chumbe Island Closed Forest Habitat. This includes educational and commercial activities related to the non-consumptive use of the above mentioned natural resources and the doing of all such other things as are incidental or conducive to the attainment of the above object." A Management Plan 1995–2005 [6] was developed with wide stakeholder participation, and further revised and updated for 2006–2016 [7] with detailed goals and objectives as summarized in Table 1.

2.1. Supporting international commitments

CHICOP's objectives also aim for supporting international commitments to which the United Republic of Tanzania is a signatory, such as the Convention on Biological Diversity (CBD) and the Nairobi Convention of 1985. Tanzania has committed itself to increase protection of its seas to 10% by 2012 and 20% by 2025 [8] and recommended the expansion of MPA systems and networks, along with promoting a supportive legislative environment for MPA establishment and management [9].

2.2. The legal framework

In 1993, the Government of Zanzibar (GoZ) Commission for Land and Environment (COLE) leased a land area of 2.44 ha on the island to CHICOP for a period of 33 years. No specific policies and legislative acts were yet available regarding MPAs in Zanzibar. Therefore, the Chumbe Reef Sanctuary was gazetted based on the laws available when the reef area was declared closed to fishing under the Department of Fisheries and Marine Resources of Zanzibar in 1994. The management of the MPA was entrusted by Management Agreement to CHICOP for a renewable 10 year period for the Reef Sanctuary. In 2004 this agreement was reviewed and extended until 2014.

3. Drivers/conflicts

The policies, legislation and management capacity of the GoZ are insufficient to meet the challenges of rapid environmental deterioration, while investment continues to be directed into unsustainable development. The main threats to biodiversity conservation are overexploitation of marine and terrestrial resources,

population increase, tourism, poverty and a lack of environmental awareness.

3.1. Overexploitation of natural resources

Tanzania and Zanzibar suffer from overexploitation of marine resources [10,11]. In particular the coral reefs are subject to destruction by unsustainable fishing methods such as dynamite fishing and beach seining [10,12,13]. Other threats are coral mining, pollution from coastal development and intensive agriculture, and the effects of climate change including coral bleaching and acidification of seawater [14]. Marine organisms such as turtles, sea cucumbers, seahorses, shells and shark fins that were formerly unexploited or non targeted, are now being harvested, mainly for export purpose [10,15,16].

3.2. Population increase, tourism and coastal development

The coastal population is growing rapidly along the East African coast [17,18]. From the 90s, the liberalization of the Tanzanian economy has opened coasts and beaches for tourism investments [19], contributing to environmental degradation of coral reefs and coastal forests, including that caused by sewage.

Uncontrolled garbage disposal from an increasing population contributes significantly to the pollution of the coastal waters via surface water run-off and leaching. Onsite waste treatment facilities are often not in place and many hotels discharge untreated wastes into the sea [20]. Moreover, drifting garbage such as plastic bags can accidentally be mistaken for jelly fish and eaten by turtles, resulting in increased turtle and seabird mortality.

3.3. Poverty

Livelihoods of the coastal communities are highly dependent on natural resources and a healthy marine ecosystem. Poverty affects conservation as it sometimes forces people to use destructive fishing practices or break regulations. Therefore, a significant factor for MPA success is integrating conservation with promotion of livelihood opportunities [21,22].

3.4. Lack of environmental awareness

There is little evidence of traditional reef management by local communities or awareness about the limitations of the resource [23]. Environmental awareness in the general public and responsive actions from GoZ lag far behind the pace of environmental deterioration, particularly concerning coral reefs [24]. As a result, decades of the destructive and unsustainable fishing methods (dynamiting, smashing corals and beach-seining) have been met with little public and governmental concern. Increased community education about environmental and fishery issues is needed to improve enforcement [10]. When Chumbe was designated, the national language Kiswahili had no word yet for corals and most people including fishers believed that these were lifeless structured rocks rather than animals. Though Zanzibar is a coral island, coral reef ecology is hardly covered in school syllabi, and extra-curricular activities such as field excursions to coral reefs are not part of school curricula [25].

3.5. Initiator of the MPA

In light of the above pressures, a private investor, who was a former overseas development worker, submitted a proposal to the GoZ for the establishment of a privately managed MPA in the early 1990s [25]. Prior to this, she scouted coral reefs around Zanzibar and identified the uninhabited Chumbe Island as most suitable, as the western fringing coral reef was comparatively diverse and shallow enough to be used for educational programs. The island also appeared to face little threat, as fishing was not allowed on its western side, as small fishing boats would have obstructed vessels plying the shipping channel to Dar es Salaam.

Traditionally, the sea surrounding the island was also a military area where the army routinely conducted shooting range exercises from the adjacent coast. In addition, few boatmen could then afford outboard engines to reach this most distant of the islets surrounding Zanzibar town. As no local resource users were to be displaced, conditions appeared ideal for the creation of a marine park that depended on co-operation with local fishers rather than government enforcement.

4. Governance framework/approach

4.1. Organizational set-up

Though a private limited company, CHICOP is in many respects managed like an NGO, especially concerning participation of a wide variety of stakeholders, as well as detailed planning, monitoring, reporting and documentation of actions and outcomes. A simplified organogram of CHICOP is provided in Fig. 1. The Advisory Committee established in 1995 has two representatives from CHICOP management and nine representatives from different stakeholder groups and institutions, mainly several GoZ departments, research

institutions and leaders from adjacent villages. Recently an international scientific advisory committee has also been set up.

Covering the west of Chumbe Island only, the Chumbe Reef Sanctuary is relatively small and thus easy to patrol. Working in collaboration with the Department of Fisheries for any legal prosecution needed, CHICOP has well trained rangers who manage patrolling and surveillance operations. The daily documentation of these efforts since the early 1990s has enabled extensive enforcement activities to be documented and set a model for enforcement that is being followed in other MPAs (Carter pers comm.).

5. Effectiveness

5.1. Fulfilling the management objectives

Following the management plan 2006–2016, CHICOP strives to manage the MPA holistically, and to ensure a high level of MPA management effectiveness. The MPA has a strong ranger team led by a professional expatriate marine biologist. Their main tasks are to oversee the conservation management and research activities on the island. They patrol the Reef Sanctuary, keep daily monitoring records on any observations, use effective non-confrontational and educational approaches to deter any attempts at poaching, assist researchers, and guide foreign and local visitors over the marine and terrestrial nature trails. The team is working closely with the international scientific committee and has a large network of experts.

Baseline surveys were conducted at the start of operations, and regular and thorough monitoring of the Chumbe marine and terrestrial ecosystems have since been conducted to ensure an adaptive management approach. Results are used for decision making and are shared through a range of information materials.

5.1.1. The marine habitats

A habitat classification map and a seagrass biomass map were developed for the marine area surrounding Chumbe Island [26]. Baseline surveys in the Chumbe Reef Sanctuary identified over 200 coral species from 55 genera and at least 432 fish species [27]. One new species of coral was found in Chumbe (*Oulophyllia chumbensis*) awaiting description (Veron, pers.comm). A recent study comparing coral reefs around Zanzibar showed that the Chumbe reef has the highest diversity of coral species, the highest number of 'unique' taxonomic units (TAUs) as well as locally rare TAUs [28]. The Chumbe Reef Sanctuary is host to several Red List species such as the hawksbill turtle (*Eretmochelys imbricata*).

From 2003, active intervention was required to control Crown-of-thorn (COT) starfish (*Acanthaster planci*) and sea urchin (*Diadema setosum*) outbreaks, likely caused by regional eutrophication in combination with overfishing. These outbreaks affected, and continue to affect all surrounding coral reefs between Zanzibar and Tanzanian mainland, while the systematic COT removal in the Chumbe Reef Sanctuary brought the outbreak to an effective halt [29].

During the 1998 El Nino coral bleaching event the MPA lost approximately 30% of its *Acropora* species, however, recovery and new growth became prevalent within two years [30], indicating a high level of resilience and the former coverage of the 'reef canopy' is being restored.

Recent research has established that the Chumbe MPA is among the most resilient reefs in the Western Indian Ocean region and likely to be less affected by environmental stress, temperature changes and other causes of coral mortality linked to climate change [31]. A related study concludes that the management status of MPAs in the region needs to be re-prioritized based on areas that

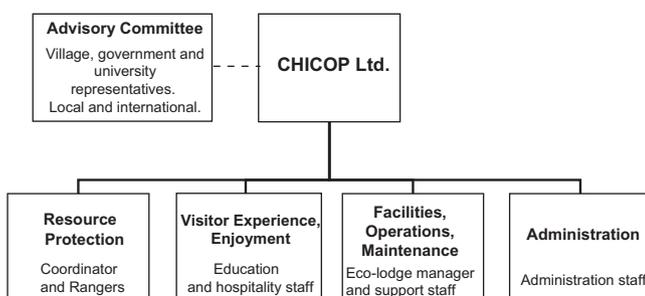


Fig. 1. Simplified organogram of CHICOP.

are both likely to survive climate change related thermal stress and have a high level of biodiversity. Chumbe ranks among the highest performers in all these categories [32].

5.1.2. The terrestrial habitats

The Chumbe Forest Reserve hosts an undisturbed ‘coral rag’ forest (tropical dry forest), which is becoming increasingly rare in the region and indeed throughout the Western Indian Ocean [33]. Fauna include rare and endangered species such as the critically endangered mini-antelope Aders’ Duiker (*Cephalophus adersi*) and possibly the world’s largest known population of Coconut crab (*Birgus latro*), listed as Data Deficient in the IUCN Red List. To date 93 species of birds have been recorded, among them rare migrant breeding populations of the Roseate tern (*Sterna dougalli*) and several others are listed as protected in the Zanzibar Forest Resources Management and Conservation Act of 1996.

5.1.3. Eco-architecture and island operations

On Chumbe Island, lodge establishment and operations are closely controlled and monitored in order to minimize any environmental impacts. All buildings on the island (7 visitors’ bungalows, Visitors Center and staff quarters) were constructed according to state-of-the-art eco-architecture including systems such as rainwater catchment, vegetative gray water filtration, composting toilets, solar water heating and photovoltaic power generation. Most systems have worked well throughout. However, though visitor numbers are limited to 18/day, the

steady increase of the occupancy rate overwhelmed the gray water filtration system with the nutrient-rich kitchen water. With professional help from specialists recruited by volunteer agencies, the system was then modified and improved.

Another mitigation measure was the calculation of the phosphorus budget of operations on Chumbe Island by an external researcher. Findings were that compost from the composting toilets and wood ash from the staff kitchen had reached a saturation point and needed to be removed from the island in order to avoid nutrient leakage into the coral reef [34]. These measures are now implemented.

5.2. Trends in effectiveness

The effectiveness of the MPA has been scored to level 4, which indicates that “most impacts have been addressed but some not completely” [35].

Due to the island status, relatively small size of the park, the committed work of the park rangers and the environmental education programs, enforcement has not been a major problem since 1994–1995. Poaching incidents have remained low due to continuing surveillance and the ever expanding education programs. Continuous research projects have been carried out over the years, whereas the monitoring programs have widened to include more habitats and species. The professional network has widened due to co-operation with research institutions and participation in national and international meetings and conferences.

Table 2

Index table for Chumbe Island Coral Park. A distilled list of the incentives employed in Chumbe Island, the incentives needed to improve governance and the cross cutting themes [35].

Name of MPA, Governance approach (effectiveness scale)	Incentive type	Incentives applied to address conflicts and provide governance steer	Incentives needed to improve MPA governance	Cross-cutting issues
Chumbe Island Coral Park (Tanzania) Managed primarily by the private sector and NGOs granted with property/management rights (2)	Economic	<ul style="list-style-type: none"> Promoting economically and ecologically sustainable resource use Green marketing of products and services from the MPA Promoting alternative livelihoods Improvements in local infrastructure and living standards Funding from private or NGO sources to promote the effectiveness of the MPA 	N/A	<i>Leadership:</i> CHICOP’s commitment to invest in conservation in an initiative considered too risky (both economically and politically) by NGOs and other investors underlines the success of the park, its leadership also critical in generating political support from high-level officials. A greater long-term commitment to CHICOP is needed from the State as there are concerns that the lease may not be renewed in the face of pressures from fishing and tourism interests
	Interpretative	<ul style="list-style-type: none"> Public communication, education and awareness-raising on the importance/vulnerability of marine ecosystems and the benefits of the MPA Promoting recognition of the potential benefits from MPAs 	N/A	
	Knowledge	<ul style="list-style-type: none"> Maximizing scientific knowledge to guide/inform MPA decision-making 	N/A	
	Legal	<ul style="list-style-type: none"> Clarity and consistency in defining legal objectives of MPAs, general and zonal restrictions, jurisdictional boundaries, roles and responsibilities of different authorities and organizations Ensuring that sufficient state capacity, political will, surveillance technologies and financial resources are available to enforce all restrictions equitably on all local and incoming users, including addressing driving forces 	<ul style="list-style-type: none"> Strengthening legal or other official basis for cross-sectoral/jurisdictional restrictions 	
	Participative	<ul style="list-style-type: none"> Participative governance structures and processes 	N/A	

6. Incentives

The following section discusses incentives employed in governing the Chumbe Island Coral Park, CHICOP, (Table 2) highlighting the key incentives within the economic, interpretative, knowledge, legal and participative categories [35,36].

6.1. Economic incentives

In Chumbe Island Coral Park (CHICOP) the key economic incentives are (1) promoting food security and sustainable fisheries, (2) promoting alternative livelihoods, as well as (3) sustainable financing for conservation.

(1) Local fishers benefit from the NTA. In 2005, 94% of artisanal fishers interviewed around Chumbe confirmed the spill-over effect by saying that they believed that fish inside the NTA travel out and increase their yields in the vicinity [38,39]. This is backed by findings from research. Compared to other MPAs (without NTAs) in the region, the Chumbe Reef Sanctuary showed to have greater biomass of commercially important fish species [38]. Fish density was also found to be higher than in 89 other MPAs (with NTAs) studied in an international review [37].

Further support to local fishers includes emergency services when in distress (park rangers assist during rough weather, and when boats, engines and sails need fixing) as there is no maritime rescue service available in Tanzania. Ranger reports show that since 1994, over 1000 fishermen (and 160 vessels) have been assisted or rescued by the rangers. Such assistance had a considerable impact on the positive relations between local communities and the MPA and is an important part of the rangers' work. Such rescue services are also now widely reported through the Fisheries Department and local radio, enhancing Chumbe's public relations to a wider audience.

(2) As a fully managed nature reserve, and also due to the particular eco-technologies chosen, CHICOP's operations are very labor-intensive. A third of the staff is directly involved in conservation management and education. With only 7 rooms, CHICOP has probably the highest employee/room ratio of any tourism business in Tanzania, and three times the international average for eco-lodges [40].

Wherever possible, CHICOP employs people from nearby communities, though with their limited formal education and skills much on-the-job-training is required. Of the 43 employees, 95% are Tanzanians, over two thirds from local communities, and 5% expatriates. In particular, former fishers were recruited and trained as park rangers and stationed on the island. Women are also given preference and form 40% of the Chumbe workforce. Other income opportunities for local communities include a regular market for food, building materials and handicrafts, outsourcing road and boat transport and craftsmen services during maintenance.

(3) Revenue generated from ecotourism is reinvested in supporting MPA management and environmental education programs. Development and operations have always been extremely cost-conscious, and CHICOP benefited enormously for the saved opportunity costs accrued by numerous volunteers helping to establish the MPA. In the development phase, the program was financially dependent on private investment and small grants from several donors for non-commercial project components.

Occupancy of the eco-lodge reached up to 86% over the first decade of operations. Today, CHICOP generates a gross annual revenue in the region of US\$ 500 000, which has since 2000 fully funded the park. Basic operations of MPA management only

require approximately 40% occupancy. Therefore, prospects of sustainability are favorable even during slumps in tourism arrivals. CHICOP has thus become the first financially self-sustaining MPA in Africa and beyond.

The revenue generating component (the eco-lodge) operates commercially and is required by law to act as a regular tourism investment, liable for all associated taxes, licenses and permits, even though the revenue generated is used for non-commercial purposes. GoZ has policies and incentives intended to encourage ecotourism and non-commercial work (such as tax exemptions, reduced land rent charges etc.), however, these are rarely implemented, and this has been a source of conflict between some GoZ departments and the Chumbe management in the early years. The non-implementation of such legally available incentives weakens the replicability of financially self-sustaining MPAs of this nature. In the first decade of operations from 1998, CHICOP has paid around US\$700,000 in taxes, fees and licenses. With an increased occupancy rate over the last few years, the yearly sum has reached approximately US\$150,000.

The sustainable management and promotion of key ecosystem services (sustainable fisheries and biodiversity conservation) for the region has been recognized on many levels, including being mentioned in the recent UN Secretary General's report to the General Assembly on protection of coral reefs for sustainable livelihoods and development, which states: "A noted example for PES (Payment for Ecosystem Services) within the context of coral reefs habitat is the private, non-profit Chumbe Island Coral Park Ltd (CHICOP) in Tanzania [41]".

Marketing Chumbe Island as a prime ecotourism destination for over a decade has also helped to promote Zanzibar as an environmentally sensitive holiday destination. CHICOP has won numerous awards for nature conservation and responsible tourism, including the UNEP Global500 Award (2000), British Airways Tourism For Tomorrow Award (1999), the National Geographic Society Geotourism Award (2008), the Global Ecosphere Retreat® certification, and Sustaina100, among others. This attracted highly visible and free publicity for both Chumbe and Zanzibar through media, travel writers, TV and radio documentaries and the Internet. For the first decade of operations (1998–2008), the monetary value of this free publicity was estimated at around 10 million US\$ worth of public relation. International awards have also helped to gain recognition at the national level. On the World Environment Day of 2004, CHICOP was recognized as "the best investment project for the protection and conservation of marine natural environment and biodiversity for the year 2003–2004" by the Zanzibar Department of Environment.

6.2. Interpretative incentives

Public communication, education and awareness-raising on the importance and vulnerability of the marine ecosystem is a key incentive for CHICOP which offers environmental education for fishers, government officials, teachers, students, tourism operators, the general public and all visitors. All island staff—rangers, guards, cooks, cleaners & waiters—are also trained in the basics of reef ecology, forest ecology, English language skills, ecotourism and eco-technology; and some of the team get specialized training for the various roles (such as teacher training, ranger training, marine ecological monitoring and others).

The Visitors Center on Chumbe Island has a classroom for school children, community groups and fisher associations with numerous materials and interactive learning tools related to conserving marine and natural resources. Nature trails in the intertidal mangrove pool and an "underwater nature trail" in the Reef Sanctuary were developed for the Chumbe EE Program. Special large floatation devices make it possible for everyone to

participate in snorkeling and discovering the underwater world, and this is especially unique for the Muslim girls and women who very rarely have the opportunity to learn how to swim. All local school excursions, teacher training workshops and associated activities are provided free of charge at the expense of CHICOP (including car & boat transport, food & refreshments, materials & staff). By September 2011, over 4500 school children and 900 teachers and several community groups had participated in this program. In collaboration with the Ministry of Education, CHICOP has incorporated a coral reef module into the local school curricula, as well as conducting teacher training related to the marine environment and environmental sustainability.

In 2011, CHICOP developed a guidebook 'Environmental Sustainability in Zanzibar' in English and Kiswahili, and trained peer educators who conduct awareness meetings with local communities about related subjects, among them the benefits of MPAs. Visitors to the MPA (local as well as international) participate in guided snorkeling, forest trail and intertidal walks to experience and learn more about the exceptional natural environment.

6.3. Knowledge incentives

Chumbe has prioritized baseline surveys, monitoring and research programs that helped to establish the conservation value of the area, and were deemed valuable in aiding management of the MPA. These programs include marine flora and fauna such as coral reef and seagrass monitoring, recording of poaching events, and gray water laboratory analysis. Even prior to the signing of a Memorandum of Understanding with CHICOP in 2004, the Institute of Marine Sciences (IMS) of the University of Dar es Salaam in Zanzibar, and foreign academic institutions linked with the IMS co-operation programs conducted regular long-term research. Shorter-term studies have been carried out by a host of academic institutions and independent researchers from around the world.

CHICOP is in close communication with regional organizations such as the Western Indian Ocean Marine Science Association (WIOMSA), Coastal Oceans Research and Development in the Indian Ocean (CORDIO), and is regularly invited to present at international conferences in the field of marine conservation and responsible tourism, such as the World Parks Congress, International Coral Reef Symposium, International Tropical Marine Ecosystem Management Symposium, ecotourism events and others.

From 1993, CHICOP has employed professional expatriate marine biologists as Conservation Coordinators, for training the park rangers and overseeing all research and monitoring programs. The park rangers have been monitoring park activities since 1992 and provide continuous data on infringements. The conservation status and threats are thus well documented [27].

Moreover, an external consultant was commissioned in 2006 for the update of the Management Plan to 2006–2016. The consultant also conducted a detailed assessment of the project performance according to the initial Management Plan 1995–2005, with very detailed and overall positive results [7].

6.4. Legal incentives

Following the gazettelement of the Chumbe MPA and Forest Reserve in 1994 by GoZ, the Management Agreements between GoZ and CHICOP give CHICOP exclusive management rights over the Chumbe Island MPA. The Management Plans 1995–2005 and 2006–2016 define objectives, activities, research regulations, and Do's and Don'ts both for visitors and staff. Only non-consumptive & non-exploitative activities are permitted. Research is limited to non-extractive studies, and fishing and non-authorized anchoring in the Chumbe Reef Sanctuary is prohibited. Scuba diving is only permitted for researchers and documentary film crews.

In order to increase enforcement capacity, rangers receive ongoing training in surveillance techniques, data management and processes for promoting and ensuring MPA compliance. Patrols are done by boat, on foot (at low tide) and from the top of the lighthouse. The Rangers are unarmed and rely on persuading fishers and building awareness. Since 2003, armed police officers are stationed on Chumbe to ensure security, and they have assisted with arrests on a few occasions. Compiled daily monitoring reports are shared with the Department of Fisheries and Marine Resources in Zanzibar.

Visitor numbers per day are restricted and only boats arranged by Chumbe can bring visitors to the park. Mooring buoys at MPA boundaries and clear educational communication between rangers and local fishers have helped considerably with enforcement, and compliance levels are high with strong and positive relations with local fishers.

6.5. Participative incentives

Management at CHICOP is participatory and involves a wide range of stakeholders.

Seven GoZ departments were involved during the project negotiations (1991–94) and since then CHICOP has regularly reported to all relevant GoZ departments. The Management Agreements further provide for an Advisory Committee comprised of GoZ representatives of the Departments of Environment, Fisheries, Forestry, leaders of four neighboring fishing villages and a representative of the Institute of Marine Sciences of the University of Dar es Salaam. The Advisory Committee meetings have been held at least twice yearly since 1995 in order to discuss the Management Plans, project progress and other issues. There have been no major disagreements on actions to take so far, though recommendations of the Advisory Committee are not binding for the CHICOP Management. Village meetings in neighboring fishing communities started 1991–92 and have been continued thereafter. Regular activity reports and biannual Newsletter are written and often uploaded to the homepage for public access. The company employs a flat organogram with section managers.

7. Cross cutting issues and factors

All project components, including park management/conservation, education, research, monitoring and evaluation, and ecotourism, have over the last decade worked effectively. However, some overarching legal and political issues remain that affect private investment in conservation and may threaten the sustainability of the MPA on the long run.

Firstly, the land lease and both Management contracts for the protected area are renewable upon expiration. However, like any land lease or agreement in Tanzania, CHICOP has no legal assurances that such renewal will occur, and each renewal period requires re-negotiation. Secondly, investment protection under the Zanzibar Investment Act of 1986 provides limited protection only against expropriation by GoZ, as the law regulates procedures for negotiating for compensation, but has no provisions for challenging expropriation as such. Thirdly, the Environmental Management and Protection Act 1996 (enacted after CHICOP had been established) affects security of tenure, and may in a worst-case scenario weaken the contractual setup of CHICOP, though non-extension of leases and contracts would be difficult to justify in CHICOP's case.

Another important consideration is the location of Chumbe on the borders to the Menai Bay Conservation Area (MBCA). This is managed by the Department of Fisheries and Marine Resources as a multi-use marine conservation area working with local communities, and plans periodical closures and enforcement

of fishing gear regulations. With the Chumbe permanent NTA neighboring the MBCA these programs work as part of the wider MPA network envisaged for Zanzibar in the Blueprint 2050. This offers exciting opportunities for widening the impact of the Chumbe NTA and promoting resilience of a wider area through network connectivity. It also, however, poses potential challenges, as the management approaches under the two institutions are different, and local fishers may receive mixed messages about regulatory oversight unless communicated well and proactively and collaboratively promoted.

8. Conclusion

After operating successfully for nearly two decades, the key mid- and long-term task for Chumbe Island Coral Park (CHICOP) is to renew the land lease and management agreements upon expiry, in order to continue managing the MPA for protection of natural resources through revenue from ecotourism. For this, CHICOP seeks political support from high-level officials, and maintains strong leadership. Such limited security of tenure may discourage other investors to follow this model in the region from both political and economical perspectives.

To improve long-term effectiveness, CHICOP promotes awareness of the benefits of the MPA to the political and local community and maintains the good relationships with GoZ ministries. In particular, CHICOP invites decision makers and officials within relevant GoZ departments into its environmental education program. Long-term support from the Government of Zanzibar remains essential for the continued and improved effectiveness and sustainability of the Chumbe MPA.

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References

- [1] Leipziger D, Allen, M. International Development Association and International Monetary fund. 2007. Available from: <http://siteresources.worldbank.org/INTDEBTDEPT/ProgressReports/21501026/HIPCProgressReportNPC2007-0910.pdf> [accessed 14.03.2012].
- [2] Central Intelligence Agency. Available from: <https://www.cia.gov/library/publications/the-world-factbook/index.html> [accessed 10.12.2012].
- [3] Francis J, Nilsson A, Waruinge D. Marine protected areas in the Eastern African Region: how successful are they? *J Hum Environ* 2002;31(7): 503–511.
- [4] Wells S, Burgess N, Ngusuru A. Towards the 2012 marine protected area targets in Eastern Africa. *Ocean Coastal Manage* 2007;50:67–83.
- [5] Spalding M, Ravilious C, Green E. World atlas of coral reefs. Berkeley: University of California Press; 2001.
- [6] Castle G, Mileto R. Chumbe Island Coral Park: Marine Park & Forest Reserve, Zanzibar: Management Plan 1995–2005. BESO/CHICOP; 1995.
- [7] Carter E. Chumbe Island Marine Protected Area, Management Plan 2006–2016. CHICOP, ICRAN, FFI, E&D Consulting, Zanzibar/Tanzania; 2006.
- [8] IUCN, Durban World Parks Congress 2003, Parks 2004; 14:2. Available from: cmsdata.iucn.org/downloads/14_2lowres.pdf [accessed 14.03.2012].
- [9] Ruitenbeek J, Hewawasam I, Ngoile M. Blueprint 2050: sustaining the marine environment in mainland Tanzania and Zanzibar. Washington D.C.: The World Bank; 2005.
- [10] Jiddawi N, Öhman MC. Marine fisheries in Tanzania. *Ambio* 2002;31: 518–527.
- [11] Nordlund L, Erlandsson J, de la Torre-Castro M, Jiddawi N. Changes in an East African social-ecological seagrass system: invertebrate harvesting affecting species composition and local livelihood. *Aquat Living Resour* 2010;23(4): 399–416.
- [12] Burke L, Byrant D, McManus J, Spalding M. Reefs at risk: a map-based indicator of potential threats to the world's coral reefs. Washington, D.C.: World Resources Institute; 1998.
- [13] Wells S. Dynamite fishing in northern Tanzania—pervasive, problematic and yet preventable. *Mar Pollut Bull* 2009;58(1):20–23.
- [14] Obura DO, Grimsdith G. Resilience assessment of coral reefs. Assessment protocol for coral reefs, focusing on coral bleaching and thermal stress. IUCN working group on climate change and coral reefs. Gland, Switzerland: IUCN; 70 p.; 2009.
- [15] Gössling S, Kunkel T, Schuhmacher K, Zilger M. Use of molluscs, fish, and other marine taxa by tourism in Zanzibar, Tanzania. *Biodiversity Conserv* 2004;13:2623–2639.
- [16] Eriksson BH, de la Torre-Castro M, Eklöf J, Jiddawi N. Resource degradation of the sea cucumber fishery in Zanzibar, Tanzania: a need for management reform. *Aquat Living Resour* 2010;23:387–398.
- [17] Silva P. Exploring the linkages between poverty, marine protected area management, and the use of destructive fishing gear in Tanzania. World Bank Policy Research Working Paper no. 3831; 2006.
- [18] Watkins K. Human development report; 2006. United Nations Environment Programme. Available from: <http://hdr.undp.org/en/reports/global/hdr2006/>; 2006 [accessed 10.12.2012].
- [19] Heita-Mwampamba N. Tourism in Zanzibar; 2003. Available from: <http://hdl.handle.net/1834/344> [accessed 10.12.2012].
- [20] Mohammed SM. Pollution management in Zanzibar: the need for a new approach. *Ocean Coastal Manage* 2002;45(4–5):301–311.
- [21] Tobey J, Torell E. Coastal poverty and MPA management in mainland Tanzania and Zanzibar. *Ocean Coastal Manage* 2006;49:834–854.
- [22] Sachs JD, Baillie J, Sutherland WJ, Armsworth PR, Ash N, Beddington J. Biodiversity conservation and the millennium development goals. *Science* 2009;325:1502–1503.
- [23] Scheinman D, Mabrook A. The traditional management of coastal resources. A consultancy report for Tanga Coastal Zone Conservation and Development Programme. United Nations Environment Programme; 1989.
- [24] Zanzibar Revolutionary Government (ZRG). National environmental policy Zanzibar: Commission for Land and Environment Zanzibar, Section 8C: 10; 1992.
- [25] Riedmiller S. Environmental education in Zanzibar: proposals for action. Department of Environment, FINNIDA, Zanzibar; 1991.
- [26] Knudby A, Nordlund L. Remote sensing of seagrasses in a patchy multi-species environment. *Int J Remote Sensing* 2011;32(8):2227–2244.
- [27] Nordlund L, Walther A. Chumbe Island Coral Park – Conservation and Education programme, Status report 2010. 1–36, Zanzibar. Available from: <http://www.chumbeisland.com>; 2010 [accessed 10.12.2012].
- [28] Zvuloni A, van Woesik R, Loya Y. Diversity partitioning of stony corals across multiple spatial scales around Zanzibar Island, Tanzania. *PLoS ONE* 2010;5(3): e9941.
- [29] Lanshammar F, Muhando C. Ecological effects of the crown-of-thorns starfish removal programme on Chumbe Island Coral Park, Zanzibar/Tanzania, paper presented at 11th ICRS, Florida, 7–11 July; 2008.
- [30] Daniels C. Conservation Co-ordinator Marine Science Report, Update report for the Department of Fisheries and Marine Resources (DFMR), Zanzibar; 2004.
- [31] Maina J, Venus V, McClanahan T, Ateweberhan M. Modelling susceptibility of coral reefs to environmental stress using remote sensing data and GIS models. *Ecol. Modelling* 2008;212:180–199.
- [32] McClanahan TR, Ateweberhan M, Graham NAJ, Wilson SK, Ruiz Sebastian C, Guillaume MMM, et al. Western Indian Ocean coral communities: bleaching responses and susceptibility to extinction. *Mar Ecol Prog Ser* 2007;337: 1–13.
- [33] Miles L, Newton AC, DeFries RS, Ravilious C, May I, Blyth S, et al. A global overview of the conservation status of tropical dry forests. *J Biogeogr* 2006;33: 491–505.
- [34] Lindstroem B. A phosphorus budget for the eco-tourist resort of Chumbe Island Coral Park, Zanzibar. MSc Thesis 2007, no. 153, Swedish University of Agricultural Sciences, Dept. of Soil Sciences; 2007.
- [35] Jones PJS, Qiu W, De Santo EM. Governing marine protected areas – getting the balance right. Technical Report, United Nations Environment Programme; 2011.
- [36] Jones PJS, Qiu W, De Santo EM. Governing marine protected areas—getting the balance right, vol. 2 (case study reports). Technical Report, United Nations Environment Programme. Available from: <http://www.mpag.info/mpag-fiscal-technical-report-vol2.pdf>; 2011 [accessed 10.12.2012].
- [37] Halpern B. The impact of marine reserves: do reserves work and does reserve size matter? *Ecol Appl* 2003;13:117–137.
- [38] Tyler EHM. The effect of fully and partially protected marine reserves on coral reef fish populations in Zanzibar, Tanzania. D.Phil. thesis, University of Oxford; 2006a.

- [39] Tyler EHM. Coral reef monitoring in Chumbe Island Coral Park: a manual prepared for Chumbe Island Coral Park. Version 1.1. CHICOP; 2006b.
- [40] International Finance Corporation, Eco-lodges: exploring opportunities for sustainable business, Washington/DC; 2004.
- [41] UN Secretary General report to the General Assembly. Available from: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N11/452/52/PDF/N1145252.pdf?OpenElement> [accessed 10.12.2012].