HIV/AIDS and Threats to Coastal Biodiversity in Tanzania

Cross-Sectoral Dimensions of HIV/AIDS, Gender, and Population Dynamics in Critical Areas

Coastal Resources Center
University of Rhode Island

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Cover photos: The four cover photos were taken during the Participatory Rural Appraisal (PRA). Clockwise from the upper left corner, they illustrate 1) fishermen landing their catch in Saadani, 2) a village map created together with the villagers in the Matipwili village, 3) key informant interviews in Matipwili, and 4) two children in the Mkwaja village.

Photo credits: James Tobey, Coastal Resources Center

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December 2005

James Tobey, Elin Torell, Melissa Thaxton, Brian Crawford,
Baraka Kalangahe, Abdhulrahman Issa and
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EXECUTIVE SUMMARY

The Population, Equity, AIDS, and Coastal Ecosystems (PEACE) initiative is a two year project supported by the United States Agency for International Development (USAID) with a focus on the role HIV/AIDS, gender and population dynamics play in the overexploitation of coastal biodiversity in Tanzania. The goal of the PEACE project is to better understand and mitigate the impacts of the HIV/AIDS pandemic on biodiversity using integrated coastal management (ICM) processes. The project demonstration site encompasses eight villages in the Bagamoyo and Pangani coastal districts and terrestrial and marine conservation zones adjacent to these villages.

This threats assessment was conducted with the goal of better understanding the challenges to people's livelihoods in the study area, the linkages between biodiversity and HIV/AIDS, and how AIDS is affecting access to and use of natural resources such as forests, wildlife, and marine resources within and outside conservation zones. The threats assessment was constructed from information collected from secondary sources, a participatory rural appraisal (PRA) in each of the eight project villages over the period January 30 - February 12, 2005, and follow-up interviews that were conducted in May and June of 2005. An interdisciplinary appraisal team spent five to six hours in each of five villages and conducted PRA exercises such as the following:

- Focus group discussions with village Environment Committees, HIV/AIDS Committees, groups of women, and groups of fishers (or other resource users)
- Village sketch map exercise
- Transect walk exercise and direct observations during fieldwork
- Trend line exercise
- Gender disaggregated activity map
- Resource control and access map
- Key informant interviews using semi-structured checklists involving health workers, traditional healers, religious leaders and influential elders

A total of 137 men and 87 women participated in meetings and exercises with the appraisal team. The PRA was followed by two sets of interviews: 1) eight with individuals (five women and three men) belonging to households affected by AIDS and 2) twenty scenario interviews with individuals (eight women and 12 men) to understand how they perceived people's behaviors would change if someone in a household fell sick or died from AIDS. Interviews were also conducted with key informants who were representatives from the tourism sector.

Information was captured on the status of biodiversity and conservation in the study area through a review of secondary data on the Saadani National Park, the Maziwe Marine Reserve, and the Collaborative Management Areas (Boza-Sange and Sange-Mkwaja-Buyuni) of the Tanga Coastal Zone Conservation and Development Program (TCZDP). A stakeholder workshop was held in April to review and provide feedback on this information. Other secondary data review includes census data and district data on HIV/AIDS. Land use and land cover changes between 1990 and 2000 were analyzed using data from Landsat images. This analysis showed that the amount of bare soil inside the Saadani Park increased by over 192 sq. km. between 1990 and 2000, while the area of grassland decreased by a similar amount. This trend is also seen in the area

outside the park but to a lesser degree. The data also showed that the amount of agricultural land outside the park (all land types with crops and cultivated lands) has increased by 76 percent. This is attributed primarily to increases in bushland with crops and woodland with crops. At the same time, there has been a large decrease in the area of open and closed woodlands outside the park.

The threats assessment confirmed that the direct impacts of HIV/AIDS on biodiversity are: 1) an accelerated rate of extraction of natural resources due to increased dependence on wild foods and wildlife, medicinal plants, timber, and fuelwood; 2) decreased availability of labor due to sickness and death within the villages and among conservation staff; and 3) loss of traditional knowledge and skills. The threats assessment also offered the following conclusions:

1. There is a trend towards increased destructive practices — especially woodcutting and charcoal making — among HIV-affected households.
2. HIV/AIDS has led to loss of staff within organizations that work with biodiversity conservation (park staff, district officers, etc.). This contributes to loss in management capacity and institutional memory.
3. Women between ages 30-40 seem most vulnerable in terms of HIV/AIDS infection rate. Women are also the ones responsible for taking care of those who are sick.
4. The coastal villages have a higher population growth rate than the district averages. They also experience a high level of seasonal migrants (fishers and salt workers), who constitute another vulnerable group.
5. The Saadani National Park has caused some dissent among the surrounding communities. Villagers feel they were not adequately involved in establishing the Park and many perceive that the Park has made their life more difficult.
6. Mechanisms to share the benefits of the National Park with the poor and burdened buffer communities would, in the long run, help reduce poverty and the nexus between poverty, unsustainable resource use, and HIV/AIDS.
7. Even though population pressures are lower in the Pwani and Tanga regions compared to the national average, some of the coastal villages (Sange, Ushongo, and Saadani) have a higher population growth rate than the national average.
8. There is also a need to incorporate HIV/AIDS-related issues in the ICM District Action Plans of Bagamoyo and Pangani and the Collaborative Management Area (CMA) plans in Tanga.

From the threats assessment we conclude there is much that is needed to be done to address the major impacts of HIV/AIDS on biodiversity conservation at village and pilot-area-wide level. Potential actions that are in the nexus between biodiversity conservation, health, population, and gender are those that are aimed at:

- Improving resource management
- Developing sustainable natural resource-based livelihoods — especially those that are less labor intensive and can be targeted at people who are directly or indirectly affected by AIDS (e.g. women).
- Providing communication, advocacy, awareness and education on HIV/AIDS and the linkages of HIV/AIDS to the environment at the district and village levels
- The prevention, care and support of HIV/AIDS affected families
- Mainstreaming HIVAIDS into local institutions and organizations

Controlling HIV/AIDS is a very complex task. It requires many players to come up with a comprehensive response to the various aspects of the prevention, care and support of HIV/AIDS-affected individuals, and to the challenge of mitigating the impact of the disease. It will be important to identify small, targeted early actions that provide short-term material benefits and serve as concrete examples of the changes that can be brought about. It is equally important to work towards longer-term benefits for the villages and the two districts by working through existing institutional structures and strategies, as well as by complementing ongoing sectoral and integrated efforts.

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PREFACE

This report is the result of a threats assessment conducted as part of the Population, Equity, AIDS, and Coastal Environment (PEACE) project. PEACE is an independent initiative closely linked to the Tanzania Coastal Management Partnership (TCMP). PEACE promotes biodiversity conservation through the sustainable use of coastal resources while at the same time seeking to enhance the quality of life of coastal people. This requires addressing the issues that result from rapidly growing coastal populations, increased numbers of HIV-positive men, women, and children, and a lack of equity, especially for women. While PEACE builds on existing programs and projects in Tanzania, it promotes a more holistic approach – one that demonstrates the links between HIV/AIDS, gender, and population and one that considers how these issues can – and *must* – be integrated into local coastal management and conservation programs. While community development and natural resources managers are increasingly aware of the pandemic and its impacts, to date few have mainstreamed HIV/AIDS-related issues into their work. In that respect, the PEACE project is a frontrunner and hope this threats assessment – as well as other project activities – will inform conservation, health, and community development practitioners worldwide.

PEACE is implemented by the Coastal Resources Center at the University of Rhode Island, with funding from American people through the United States Agency for International Development (USAID) and managed through the USAID Bureau for Economic Growth, Agriculture and Trade Office of Natural Resource Management in Washington DC. The PEACE project works in partnership with Tanzania's National Environment Management Council (NEMC), the Ministry of Natural Resources and Tourism, the districts of Pangani and Bagamoyo, the Saadani National Park, the local nongovernmental organization of Uzi Kwa Sanaa, private sector representatives, affiliates at the University of Dar es Salaam, and core implementing partners – the World Conservation Union (IUCN) Tanzania, and the Population Reference Bureau (PRB).

This report was prepared by James Tobey, Elin Torell, Melissa Thaxton, Brian Crawford, Baraka Kalangahe, Abdhulrahman Issa and Ndalahwa Madulu. We are grateful for the assistance and feedback provided by Vedast Makota, Rose Sallema, Vera Pieroth, Angela Nyaki, and Lewis Nzali. We also appreciate the contributions provided by the Saadani National Park and the Village, Ward, and District officials of the study area.

ACRONYMS

CMA	Collaborative Management Areas
CMAC	Council Multi-sectoral HIV/AIDS Committees
CRC	Coastal Resources Center
HIV/AIDS	Human Immunodeficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS)
IUCN	The World Conservation Union
MPRU	Marine Parks and Reserve Unit
MZP	Management Zone Plan of Tanzania National Park
NEMC	National Environment Management Council
PRA	Participatory Rural Appraisal
PRB	Population Reference Bureau
SANAPA	Saadani National Park
STI	Sexually Transmitted Infection
TANAPA	Tanzania National Park
TCMP	Tanzania Coastal Management Partnership
TCZDP	Tanga Coastal Zone Conservation and Development Program
TFR	Total Fertility Rate
TRC	Tanzania Railway Corporation
UDSM	University of Dar es Salaam
USAID	United States Agency for International Development
VCT	Voluntary Testing and Counseling Program
WCST	Wildlife Conservation Society of Tanzania

INTRODUCTION

The Population, Equity, AIDS, and Coastal Ecosystems (PEACE) initiative is a two year project supported by the United States Agency for International Development (USAID) with a focus on the role that HIV/AIDS, gender and population dynamics play in the overexploitation of coastal biodiversity in Tanzania. The goal of the PEACE project is to better understand and mitigate the impacts of the HIV/AIDS pandemic on biodiversity using integrated coastal management (ICM) processes. Key outcomes anticipated from the project include:

1. Enhanced awareness and understanding of the impacts of HIV/AIDS on biodiversity conservation among policymakers and conservation managers at national and local levels
2. Development and implementation of strategies for enhanced conservation and sustainable use of biodiversity that integrate HIV/AIDS, gender and demographic dimensions
3. Documentation of lessons from experience and synthesis of broader policy implications

This threats assessment was conducted with the goal of better understanding the challenges to peoples' livelihoods in the study area, the linkages between biodiversity and HIV/AIDS, and how AIDS is affecting access to and use of natural resources such as forests, wildlife, and marine resources within and outside conservation zones. It is only recently that the rural dimension of the HIV/AIDS pandemic and the impacts on conservation are being fully appreciated in Tanzania and worldwide. To date, most of the information on the links between HIV/AIDS, biodiversity, and natural resource management is anecdotal.

The impacts of HIV/AIDS on conservation success in Africa were noted at the recent World Conservation Congress in Bangkok, Thailand (November 2004). A resolution adopted by the Congress notes that HIV/AIDS is reducing the biodiversity management capacities of conservation organizations including protected area staff, and local communities. It also notes that as AIDS-affected households lose salary earners and capacity for heavy agricultural and fisheries labor, they often turn to unsustainable use of natural resources and fall into deeper poverty.

The impacts of HIV/AIDS on biodiversity are particularly important in Tanzania where HIV prevalence is estimated to be 7 percent of people between the ages of 15 and 49 (USAID, 2005). Up to 50 percent of hospital beds are occupied by patients with HIV/AIDS-related illnesses and HIV/AIDS has become the leading cause of death among adults (USAID, 2004). The impacts of HIV/AIDS on the labor force, society and poverty has become one of the major challenges to sustainable development.

The project demonstration site encompasses eight villages in the Bagamoyo and Pangani coastal districts as well as terrestrial and marine conservation zones adjacent to these villages (see Figure 1). The villages were specifically selected for their importance to biodiversity conservation. All the villages border or are surrounded by the Saadani National Park [1]—recently upgraded from game reserve to National Park status. This

[1] The Park has not yet been gazetted and therefore is not legally incorporated. For simplicity, we refer to the Park as Saadani National Park, although it is still the Proposed Saadani National Park.

status provides for a higher level of protection for biodiversity conservation within the Park and creates a need to rethink conservation strategies and interactions with neighboring communities. In addition, six of the project villages are part of community-based, fisheries management plans. The Boza-Sange Collaborative Management Plan includes two closed reefs (Maziwi reef of Maziwi National Marine Reserve and Dambwe reef), and encompasses the Madete beach area of the Saadani National Park. The villages in the project thus encompass a mix of both land and sea environments and several types of protected areas.

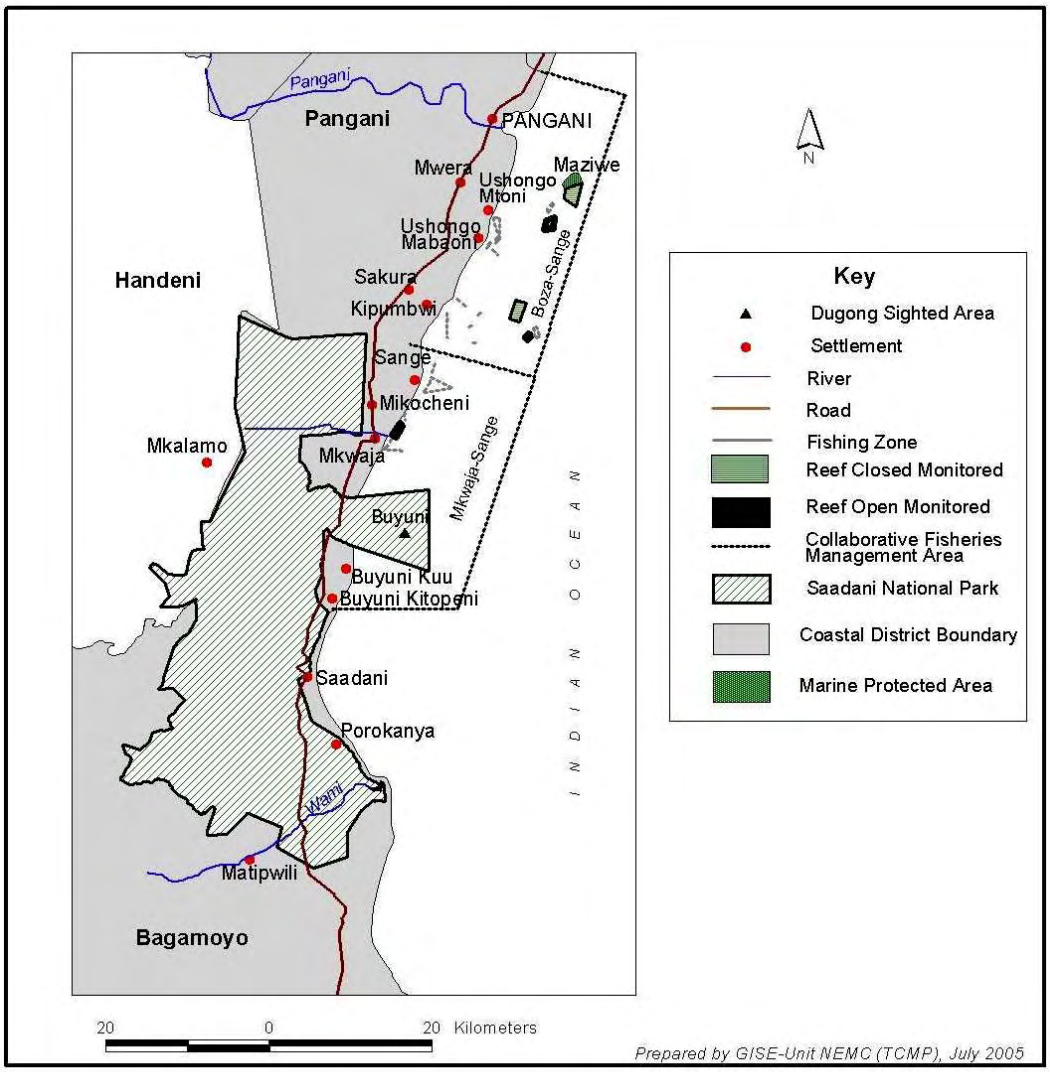

Figure 1. PEACE Project Demonstration Site

This report documents the immense challenges to people's livelihood in the eight demonstration villages from the perspective of natural resource use, migration patterns, gender and park management. We show that the villages are characterized by factors that make these communities susceptible and vulnerable to the impacts of HIV/AIDS. This includes widespread poverty, significant seasonal migration and movement of people, food insecurity, gender inequalities, and poor health services. The PRA exercise was able to verify few direct links between HIV/AIDS and resource use. To untangle the

possible impacts of HIV/AIDS on local resource use and the factors driving livelihood practices would require having more time in the eight communities and expanding efforts with household surveys and data analysis. Despite this shortcoming, the PRA activity has uncovered important information about the study area, gender relations, livelihoods, and biodiversity—information that will inform the development of action strategies to prevent or mitigate the potential impacts of HIV/AIDS on biodiversity conservation and vice versa.

Tools and Methods

This report is constructed from information collected from secondary sources, a participatory rural appraisal (PRA) in each of the eight project villages over the period January 30 - February 12, 2005, and follow-up interviews conducted in May and June of 2005. The PRA methodology helps to characterize conditions and identify community problems. An interdisciplinary appraisal team spent five to six hours in each of five villages and conducted PRA exercises such as:

J. Tobey

Village sketch map exercise

- Focus group discussions with Environment Committee, HIV/AIDS Committee[2], groups of women, and groups of fishers (or other resource users)
- Village sketch map exercise
- Transect walk exercise and direct observations during fieldwork
- Trend line exercise
- Gender disaggregated activity map
- Resource control and access map
- Key informant interviews using semi-structured checklists involving health workers, traditional healers, religious leaders and influential elders

A smaller appraisal team conducted a less comprehensive set of exercises and meetings in three of the villages (Buyuni, Sange, and Mikocheni). In total, 136 men and 85 women participated in meetings and exercises with the appraisal team.

The PRA was followed by two sets of interviews: 1) eight with individuals from HIV/AIDS-affected households, and 2) 20 scenario interviews with individuals to understand how they perceived that people's behavior would change if someone in their household fell sick or died from AIDS. Interviews were also conducted with key informants who were representatives from the tourism sector.

[2] Multi-sectoral HIV/AIDS Committees (CMAC) were formed in Tanzania in 2003 starting at the Council level, down to the community level. The Council Multi-sectoral HIV/AIDS Committee is the overall coordinating body for the district response and is responsible for monitoring the implementation of all HIV/AIDS control activities. Below the CMAC is the Ward HIV/AIDS Committee, and in the final tier is the Village AIDS Committee. Our focus group interviews were with the Village HIV/AIDS Committees.

Table 1. Participants in PRA exercises

Village	Village Environment Committee	HIV/AIDS Committee	Key Informants	Women's Group	Fishers/Resource Users Group
Matipwili	8M, 8F (combined)		9M	-	2M, 4F
Saadani	6M, 4F (combined)		6M, 3F	10F	5M
Mkalamo	10M, 3F (combined)		11M, 1F	6F	10M
Mkwaja	8M, 4F	3M, 2F	5M, 3F	7F	4M
Ushongo	2F 4M	-	6M, 3F	3F	13M
Buyuni	-	-	2M	10F	7M
Sange	8M	-	3M	5F	-
Mikocheni	5 M	-	4M	8F	-
Total	**70 (46M, 21F)**	**5 (3M, 2F)**	**55 (46M, 9F)**	**49F**	**45 (41M, 4F)**

A review of secondary data on the Saadani National Park, the Maziwe Marine Reserve, and the Collaborative Management Areas (Boza-Sange and Sange-Mkwaja-Buyuni) of the Tanga Coastal Zone Conservation and Development Program (TCZDP) provided critical information on the status of biodiversity and conservation in the study area. A stakeholder workshop was held in April to review and provide feedback on this information. Other secondary data review includes census data, district data on HIV/AIDS, and geographic information systems (GIS) data on land cover and land use change.

BIODIVERSITY AND CONSERVATION IN THE PROJECT SITE

The project site includes a number of protected areas that aim to conserve marine and terrestrial biodiversity of the area. The largest is Saadani National Park that includes both terrestrial and marine areas. There are also a number of small marine conservation areas including the Maziwe Island Marine Reserve, and no-take zones as part of collaborative fisheries management areas. These protected areas and their respective biodiversity are described below.

MAZIWE ISLAND MARINE RESERVE

Maziwe island submerged in the late 1970s and now remains as a sand bank and coral reef located to the east of Pangani district (see Figure 1). The island was established in 1975 as a marine reserve under the Fisheries Act No.6 of 1970 and this status was reconfirmed by the Marine Park and Reserves Act No. 29 of 1994. The main purpose of establishing the reserve was to improve the ecosystem, conserve species, increase fish production and boost the income of adjacent mainland coastal villages. The reserve was under the responsibility of the Pangani District Council during the 1970s. However, the Marine Parks and Reserve Unit (MPPRU) assumed authority over the Maziwe Reserve and all other marine reserves and parks in Tanzania following the 1994 Act. The Marine Parks and Reserve Unit then delegated management authority back to the Pangani

District Council. The MPRU provides support to the Council. This includes providing park management guidelines and helping to build staff capacity.

The reefs of the Maziwe reserve are rich in biological resources. A wide range of species has been recorded. These include over 200 species of fish, 35 genera of both soft and hard corals, sea grass, algae, sponges and many types of shorebirds. Earlier, the reef surrounding the Maziwe Island was infested with sea urchins, an indicator of poor reef health. The situation improved following the introduction of management measures that included zones for closed and open reefs and strict local fishing regulations. Reef monitoring conducted by the Tanga Coastal Zone Conservation and Development Program (TCZCDP) has documented a significant decline in urchin density on open reefs from 300 individuals per 100 square meters in 1998 to 100 individuals. A remarkable improvement was also recorded on the closed reef where no sea urchins are now recorded. Live coral cover has also improved over the years, increasing from 45 percent in 1999 to approximately 75 percent on the closed reef. Some improvements have also been recorded on the open reefs.

J. Tobey

Fishing boats in the PEACE area

The Maziwe area is a primary fishing ground for the mainland villages of Choba, Pangani East, Pangani West, Bwani, Ushongo, Stahabu, Kipumbwi and Sange. It also attracts fishermen from other parts of Tanzania as far away as Mtwara, Kilwa, Mafia, and Zanzibar and from Mombasa, Kenya. The area is part of the Boza-Sange Collaborative Management Area (CMA) initiated under the TCZCDP (see Figure 2). This has enabled the active participation of the nearby communities—through the facilitation of their Village Environment Committees—in management of the reserve and surrounding fishing areas. Coupled with the delegation of reserve management to the District Council and combined with the CMAs, this area represents an impressive integrated resource management system.

Swimming, diving, snorkeling, and research are other uses of the area. A visitor fee of Tsh 1000/- was introduced recently and is charged to tourists visiting the reserve. The Pangani District Council collects and manages the visitors' fees with the help of neighboring hotels. There has been a steady increase in the number of tourists visiting the reserve and thus in the amount of fees collected (see Table 2). July to January of each year is the busiest period for tourism.

Table 2. Number of visitors and income from fees collected for entrance to the Maziwe Marine Reserve

Year	Number of Visitors	Total Fees Collected (Tanzanian Shillings)
2002	216	216,000
2003	370	370,000
2004	448	448,000
2005 (Jan-March)	228	228,000

Source: Pangani District Council, Natural Resources Department

The Pangani District Council is promoting eco-tourism to encourage sustainable use of resources while ensuring access by the community to the accrued benefits. The Council is planning to take the following measures to promote ecotourism:

- Raise awareness of the resources in the reserve through the use of brochures, underwater video and other communication methods
- Increase enforcement of conservation measures—with the support of the community
- Strengthen collaboration with hotel owners

Maziwe was an important turtle-nesting ground, especially for green turtles, before the island submerged. Approximately 200 turtles were known to nest at Maziwe Island before it disappeared (TANAPA, 2003). However, the TCZCDP monitoring team has observed that some turtles still come to nest on the remaining sandbar. The team did express concern that the environment is not conducive for eggs to hatch, as the sandbar remains underwater most of the time. With the loss of the nesting ground at Maziwe, it is believed that some of the turtles have migrated to nearby beaches along the coast for nesting.

The Pangani district faces several key challenges in managing the reserve. This includes law enforcement to control illegal fishing, sustainable financing of the reserve management and enforcement activities. The latter will be especially true when the support of the TCZCDP, funded by Irish Aid, comes to an end in a few years. Another challenge is the reemergence of dynamite fishing in the area. During the time of the PRA exercise, a dynamite blast was reported on the Maziwe reef—the first blast recorded in a long time.

SAADANI NATIONAL PARK

Saadani National Park is located along the coast, about 80 km north of Dar es Salaam. The Park land includes the former Saadani Game Reserve, Mkwaja Ranch, Zaraninge Forest Reserve, Wami River estuary, Madete beach and ocean extension. Tanzania's legislative body approved the law establishing the Park in October 2004. The Park will be legally established when the President of the United Republic of Tanzania signs an Act so designating it with official status as a National Park and when the government issues official notice of this designation. The combined area of the proposed Park is 1,137 square kilometers of which 66 square kilometers is marine area (TANAPA, 2003). The proposed marine area extends out to sea 10 km from Madete Beach (see Figure 1). The extension into the Indian Ocean provides protection to a reef found offshore. The Park cuts across the Tanga and coast regions and is situated in the Pangani and

Bagamoyo districts, with a small portion in Handeni district (Table 3). There are ten villages bordering the Park with a total population of approximately 35,000 persons.

Table 3. Administrative districts associated with the Saadani National Park

Region	District	Area (sq. km.)	Percent
Tanga	Pangani	512	45
Tanga	Handeni	12	1
Coast	Bagamoyo	610	54
TOTAL		1134	100

Source: TANAPA, 2003

Prior to this area having Park status, different administrative authorities were managing the area now encompassed by the Park. Tanzania National Parks (TANAPA) is now the sole authority in managing the whole ecosystem. TANAPA has developed a Management Zone Plan (MZP) for the Park that was approved by its Board of Trustees in January this year (TANAPA, 2003). The MZP provides measures to guide the management and wise use of resources during the interim period before preparation of a comprehensive General Management Plan. The MZP provides guidance on resource conservation, use and management of the Park including infrastructure development and participation of and benefit sharing with stakeholders. Integration of HIV/AIDS-related issues was not considered in the preparation of the MZP.

Saadani is the only park in Tanzania that includes both terrestrial and marine areas and the only national park in Tanzania with a marine zone. All other marine protected areas are reserves or no-take zones as part of CMAs and therefore are managed under different authorities. Saadani is the only accessible terrestrial protected area along the coast of East Africa that is close to a large urban area such as Dar es Salaam. The area is likely to be the source of both local and international tourism growth once adequate facilities, communications and infrastructure are in place. In addition to the Park, the area has many tourist attractions such as beaches, reefs, sport fishing, and historical sites. There are currently a few tourist facilities such as rest houses and safari tents. There is one tourist operation within the Park—a 20-bed tented camp located at the mouth of the Mvavi river, just north of Saadani village. The Park also maintains a guesthouse in the same area. There are about 200 tourist beds in Pangani and 400 beds in Bagamoyo — towns from which tourists can make day-trips to the Park. However, tourist numbers are still low —approximately 30-80 persons visit the park on a monthly basis (TANAPA, 2003).

The following are some of the main resource-use issues that have been identified for the Park:

- Subsistence and commercial poaching of wildlife, forest products and marine resources
- Threats to resources, biodiversity and ecosystems in general due to development (tourism, proposed coastal road development, Wami River water extraction, mineral prospecting, etc.) and whose impacts to the environment are not properly assessed
- Lack of up to date biological information on status and trends of biological resources

- Resource use and boundary conflicts between communities and the Park authority in balancing conservation needs and community livelihoods
- Plans to ensure equity, access and benefit sharing from resource use of the area

The Park is very unique as it is Tanzania's only coastal wildlife reserve with a wide variety of habitats including closed forest reserve, wetlands, palm and acacia woodlands, open grasslands, coastal thickets, river and estuarine systems, mangrove swamps, and marine areas. These habitats accommodate a wide variety and high number of endemic plants, animals, birds and invertebrates.

MARINE RESOURCES

Marine resources include mangroves, sea grasses, algae and reefs. Mangroves are important in soil formation, filtration and removal of organic materials from runoff, stabilizing coastal banks and provide habitat and nursery grounds for birds and fishes. There are approximately 55,635 ha. of mangroves in the area. The predominant species are *Avicennia marina, Rhizophora mucronata, Cerops tagal, Sonneratia alba, Xylocarpus granatum*. Marine animals include fish, sea turtles, gastropods, echinoderms, and corals. They form an important part of the marine ecosystem and provide a source of livelihood for fishing communities. A detailed biodiversity assessment of the marine and coastal part of Saadani National Park has not yet been conducted.

The Park has a short stretch of beach located about 13 km. south of Mkwaja village. The beach stretch is one of the few turtle nesting sites remaining in Tanzania, and the only protected area for nesting turtles along the entire mainland coastline. With no other safe nesting sites along the coast between the Kenyan border and Dar es Salaam, this stretch is critical for the endangered marine green turtle (*Chelonia midas*). An environmental NGO (Amboni Group) is supporting a turtle- breeding center close to Madete beach. The Management Zone Plan states that the center will be taken over by TANAPA once the park has been formally declared (TANAPA, 2003). The center was established after observations showed that there was complete mortality of turtle eggs caused by natural predators and disturbance from humans. Eggs laid on the beach are taken to the center and reburied with particular attention given to the depth and orientation of the egg. The hatchlings are released into the ocean once they have hatched.

There is a small marine reef approximately seven kilometers off Madete beach that rings a sand island that is only exposed at low tide. This type of ecosystem is a first for TANAPA and the Saadani National Park Management Zone Plan recommends that a complete inventory of the resources of this reef be completed as soon as possible (TANAPA, 2003). It is further recommended that the study tie in with those underway by the Tanga Coastal Zone Conservation and Development Program.

TERRESTRIAL RESOURCES

Saadani National Park (SNP) is the only coastal protected area that is accessible and near urban populations that contains animals such as elephant, giraffe, zebra, greater kudu and wildebeest. The special biodiversity value of the proposed SNP is the

existence of the only population of Roosevelt sable (*swala*) in Tanzania and the most northeasterly population of Liechtenstein's hartebeest.

A recent survey by the Wildlife Conservation Society of Tanzania (WCST) revealed the existence of more than 200 species of shorebirds and waterbirds, including some migratory species that move to the area from other parts of the world. WCST are still analyzing the results of collected data and information on birds of the area.

The Zarangire forest is reported to be the largest and least disturbed coastal lowland forest in Tanzania. It has a high number of coastal forest endemic plants, birds and invertebrates. As a small remnant of the eastern Africa coastal forest, it is of high biodiversity value. A small wetland is present in the forest, which contains sedge, cyperus and other grass flora.

J. Tobey

A buffalo skull hanging in the yard of the SANAPA lodge

The Wami River and estuary form part of the ecosystem of the Park and are an important source of water for animals especially during the dry season. The Wami River is the only freshwater river source that flows year-round. Hippopotamus, crocodiles and associated inter-tidal wildlife populate the Wami estuary.

COLLABORATIVE MANAGEMENT AREAS FOR COASTAL AND MARINE RESOURCES MANAGEMENT

Collaborative Management Areas (CMAs) were established under the Tanga Coastal Zone Conservation and Development Program (TCZCDP). These are near-shore marine areas managed primarily for fisheries purposes and include no-take zones that also provide conservation benefits. The program covers the three coastal districts of Muheza, Pangani and the Tanga municipality within the Tanga region. The program started in 1994 and based on its field experience has adapted its approach to fisheries and marine management over time. CMAs involve development of plans covering a wide range of issues with multiple villages using common marine resources. The main objective of the Program has been to improve livelihoods through better and sustainable management of marine resources. The fundamental approach is to involve resource users in the participatory development, review, negotiation and implementation of plans.

Six CMAs have been established (Table 4). The areas vary in size from 100 — 559 square kilometers. The high water mark forms the boundary of the landward side of each CMA. The seaward boundary is determined by a line connecting the reef base of the seaward side of the outermost reef. Some of the boundaries were determined through a negotiation process and essentially represent the point where there is the smallest

amount of overlap in resource use by different villages. The PEACE project site falls within the Boza-Sange and Sange-Mkwaja-Buyuni CMAs (Figure 2).

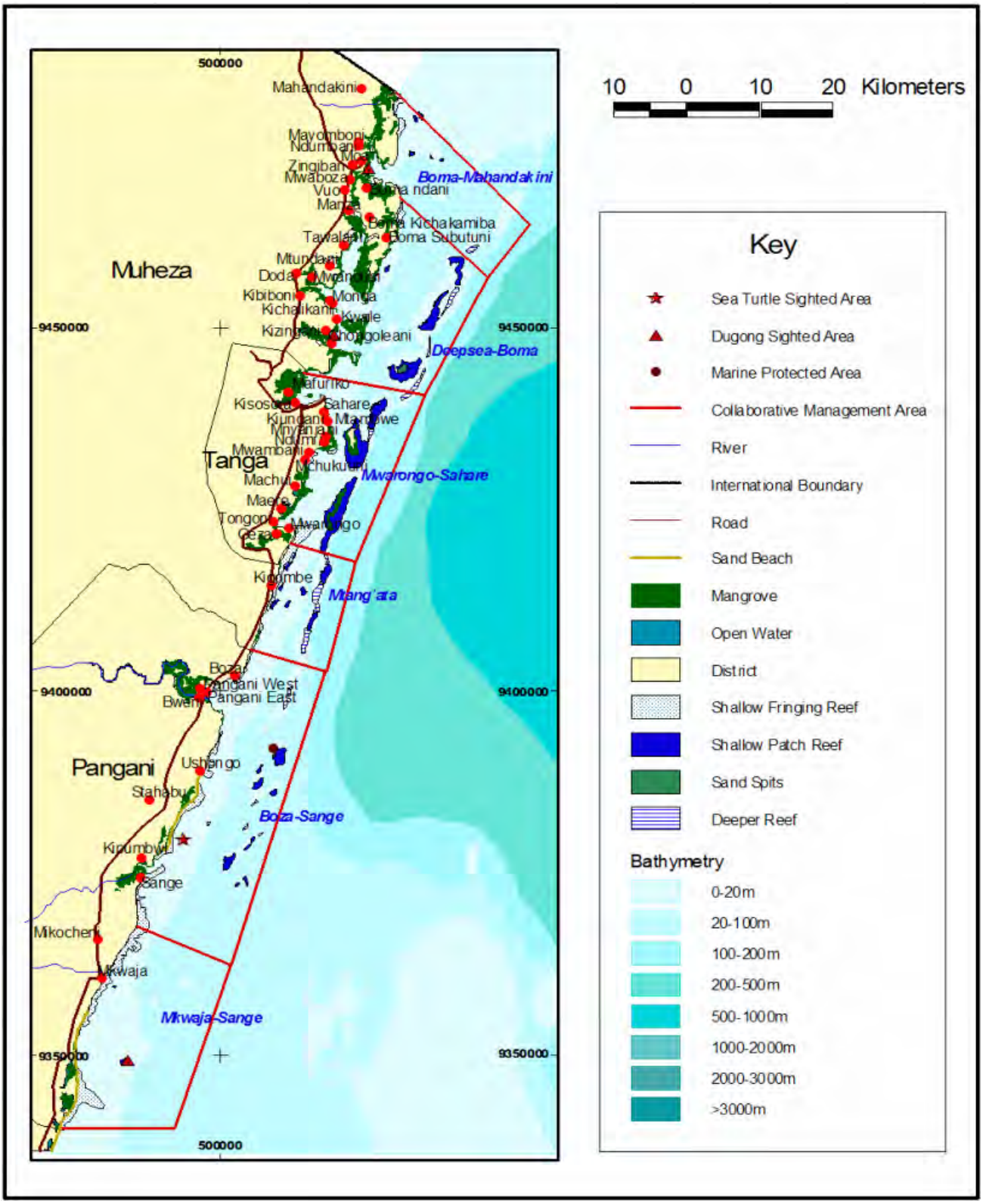

Figure 2. Six Collaborative Management Areas in Tanga Region

Table 4. Key Features of the CMAs

Name	District	Adjacent Villages	Wards	Size (sq. km.)	Closed area (sq. km.)	Date of Development (Approval)
Boma - Mahandakini	Muheza	Vuo B, Mwachala, Zingibari, Mwaboza, Moa, Ndumbani, Mayomboni, Mahandakini	Moa	100	2	2000 (2001)
Deep Sea - Boma	Tanga - Muheza	Deep Sea, Kisosora, Naoya, Chongoleani, Kizingani, Kwale, Monga/Vyeru, Kichalikani, Doda, Kibiboni, Mwandusi, Mtundani, Tawalani, Manza, Boma Subutuni, Boma Kichakamiba	Deep Sea, Kwale, Kichlikani Mwandusi	400	10	Sept 2000 (2001)
Mwarongo - Sahare	Tanga	Mwarongo, Geza, Tongoni, Maere, Machui, Mchkuuni, Mwambani, Ndumi, mnyanjani, Mtabwe, Kiungani, Sahare	Tongoni, Machui, Mwarono Sahare	300	1.5	July 1999 (2000)
Mtang'ata	Muheza, Tanga	Kigombe, Mwarongo, Geza, Maera	Kigombe	150	2	July 1996
Boza — Sange*	Pangani	Boza, Pangani East, Pangani West, Bweni, Ushongo, Stahabu, Kipumbwi, Sange	Pangani, Kipumbwi Ushongo, Stahabu	559	10	Sept 1996 (1999)
Sange-Mkwaja-Buyuni*	Pangani, Bagamoyo	Mkwaja, Mikocheni, Sange	Mkwaja	405	0	Sept 2000 (2001)

* Boza-Sange and Sange-Mkwaja-Buyuni CMAs are part of the PEACE Project site

Reef closure has been one of the resource management strategies employed by the CMAs. Criteria for reef closure are discussed and agreed by villagers with facilitation and support of the District Officers. These criteria include reef condition, number of fish species, fish density, ease of managing and patrolling, accessibility for older fishers, and the subject reef's position relative to currents and other reefs. Initially, closures were for one year with an option for extension, but all closed reefs have remained closed.

The Boza-Sange Collaborative Management Plan includes five shallow water coral reefs (Chachale, Nyanvui, Mugungu, Maziwe and Dambwe) located about five kilometers to sea from Ushongo village, and two closed reefs: Maziwe and Dambwe. Maziwe reef is large with a high conservation value with the highest number of coral genera in the Tanga region. It is in good condition with high live coral cover and has good standing stock of fish and octopus. The Sange-Mkwaja-Buyuni CMA does not have a closed reef.

REEF HEALTH

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A system of reef monitoring was initiated by the TCZCDP in 1998. All the reefs in the six CMAs of the Muheza, Tanga and Pangani districts are monitored twice a year for reef condition (e.g. counts of hard coral, soft coral, and dead coral), and fish and invertebrate counts. Monitoring teams were set up for each management areas, and the villagers involved were trained to record data on reef health (percent cover and urchin density), reef fish, and other commercially or ecologically important species. The techniques were adapted from those used by the Coral Reef Conservation Project in Kenya and the Global Coral Reef Monitoring Network (Horrill et. al. 2001).

Each monitoring event consists of two random transects—one on a reef closed to fishing and another on an open reef. Each transect takes a day to complete by a team of 10 trained local people supervised by the Tanga Program monitoring leader. Twice a year, for a period of about 17 days, they work their way down the coast collecting data from the reefs. The reefs are shallow enough to allow the use of snorkeling equipment for the monitoring thus avoiding the more expensive and complicated use of SCUBA equipment.

There are large differences between the six CMAs in terms of reef health reflecting natural differences in their biophysical aspects as well as historic resource use patterns and distance from major population centers. This variation in reef health is also seen in inner and outer reefs, probably reflecting both accessibility and differences in natural community structure. All data presented below is from the TCZCDP monitoring efforts. Figures 3 and 4 show reef health across all the CMAs in terms of live coral cover, and quantity of mollusks and crustacea[3]. The data indicate that the reef health of the two CMAs included in the PEACE project area - the Boza-Sange and Sange-Mkwaja-Buyuni CMAs- is good, compared to the other CMAs.

[3] Figures 3-8 are based on secondary data provided by the Tanga Program. Because of gaps in this information, we do not have the data to show 95% standard errors or confidence intervals for figures 3-7.

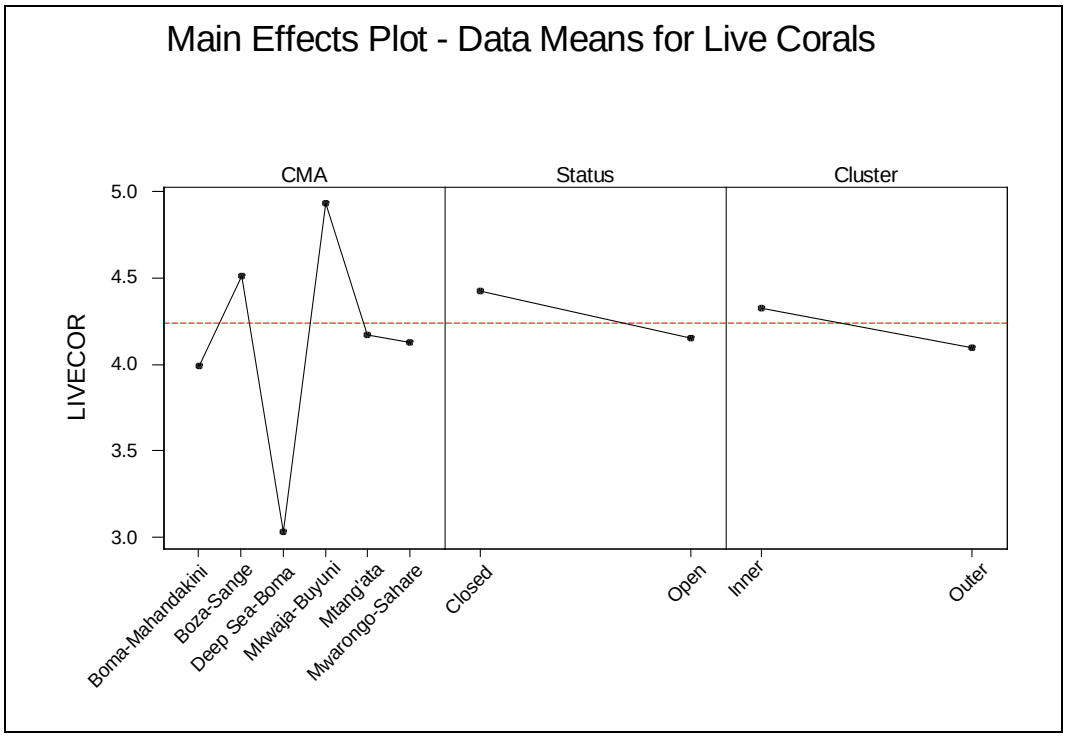

Figure 3. Live coral in the CMAs (percent coral cover)

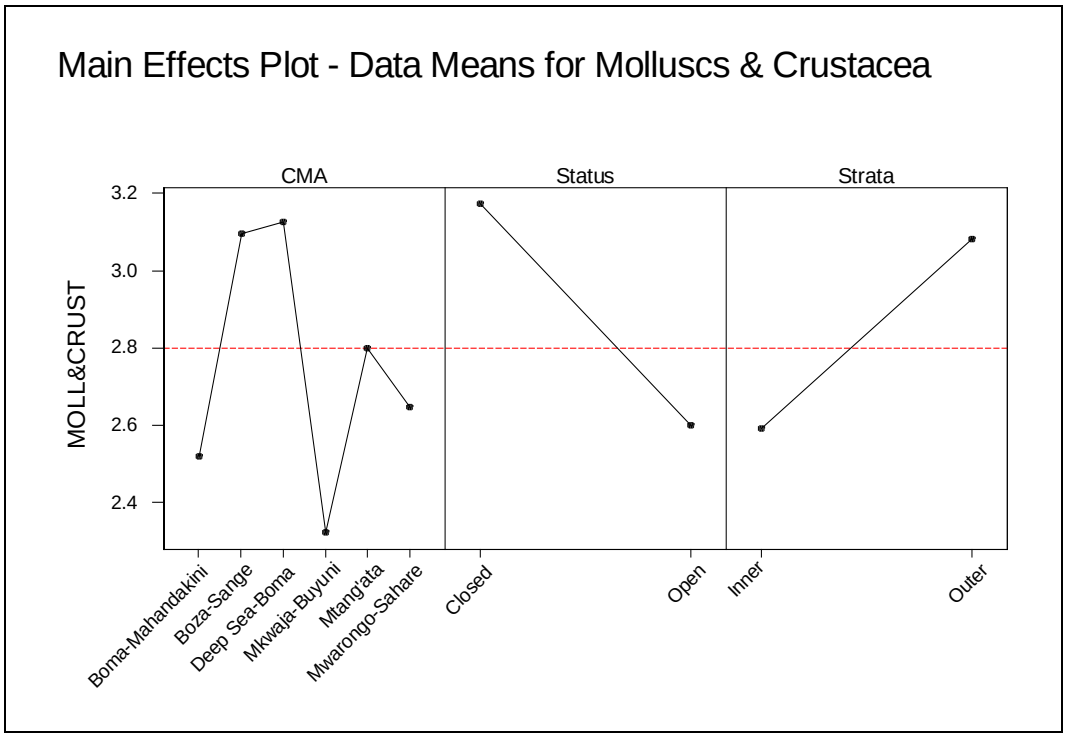

Figure 4. Mollusks and crustaceans in the CMAs

Figure 3 and 4 also show that live coral cover and populations of selected exploited species (shells, crayfish) are higher in closed reefs than open reefs. High live coral cover is an indicator of reef health. High abundance of shellfish and crayfish are also indicators of reef health. Higher abundance of marine species (coral, shellfish and crayfish) inside compared to outside the no-take zone is a demonstration of the classic reserve effect (see Halpern and Warner, 2002 for more information on the reserve effect). It suggests good compliance with the no-take rules resulting in positive bio-diversity benefits from the management regime.

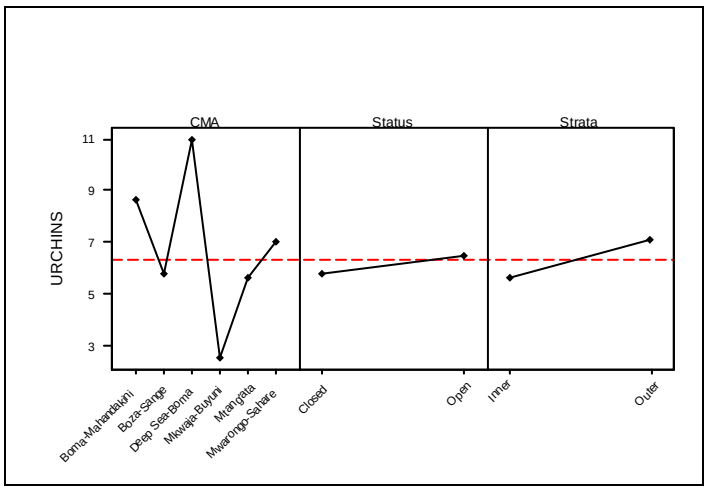

Figure 5. Abundance of sea urchins in the CMAs

Figure 5 shows abundance of sea urchin populations, an indicator of reef degradation in the Indian Ocean. Sea urchin populations are lower in closed reefs than open reefs. Urchin abundance usually increases in areas with high levels of dead coral as they feed on algae that covers coral that has been damaged or killed by destructive practices such as dynamite fishing. Urchin abundance will also be higher in areas with low abundance of urchin predators such as trigger fish. Fishers target triggerfish. High abundance of trigger fish would be an indicator of good reef health.

FISH ABUNDANCE

The moving average abundance of reef fish in all CMAs is provided in Figure 6. The data show a gradual increase over time on closed and open reefs, with a noticeable drop in 2002 for reef fish on open reefs followed by recovery (Figure 6). However, there is a high level of variability from year to year and from site to site making interpretation of this secondary data difficult. The general improvement in reef fish populations is likely due to reduction of destructive fishing, especially dynamite fishing and improvement of reef habitat. However, in 2004 when the most recent data is

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Fish caught by a Saadani Fisherman

available, there is little difference between reef fish abundance inside and outside the closed areas. A reserve effect with higher abundance inside closed areas would be expected as is seen in the coral, mollusks and crustacean data. While reductions in destructive fishing may explain the increase in overall abundance of fish, the small reserve effect is puzzling and may indicate that overall compliance concerning no fishing rules in the no-take zones may be declining. However, the variability from year to year may also indicate difficulties with the monitoring methodologies used, such as using a too-small sample size. In addition, aggregation of data for multiple sites confounds specific results on particular reefs, where trends for each site may vary.

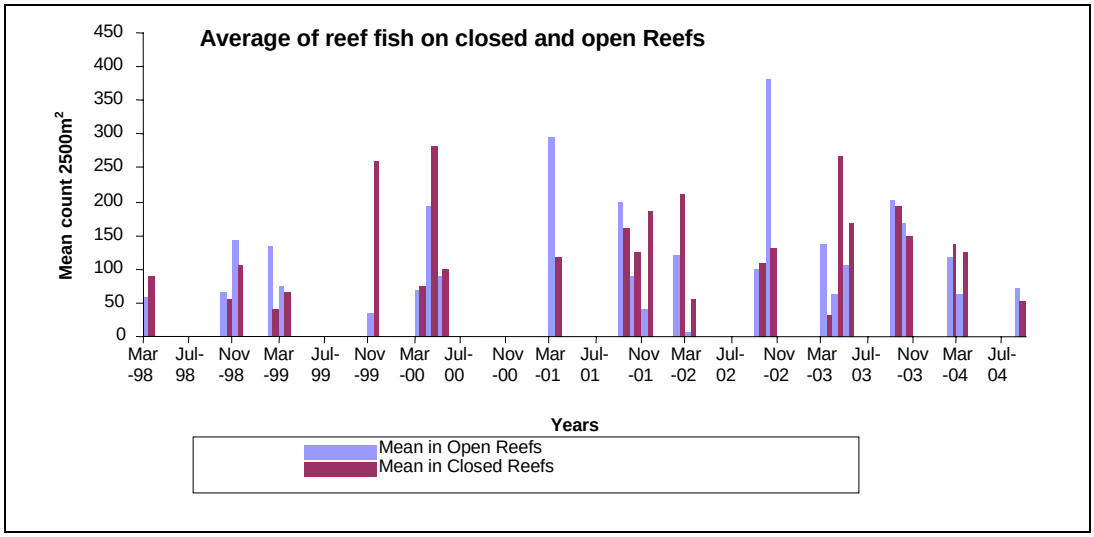


Figure 6. Comparison of closed and open reefs for reef fish in all CMAs

Secondary data on the specific CMAs in the PEACE site are available and presented in Figures 7 and 8. The average number of commercial reef fish in the Boza-Sange CMA has varied over time (Figure 7), but at all monitoring events, abundance has been greater on the closed reefs. It is not clear if there has been a real decline in the closed reefs or if it is the numbers of commercial fish that fluctuate over time. But there seems to be a smaller difference in abundance between open and closed reefs in the 2001 — 2004 period compared to the 1997 — 1999 period as well as a declining trend in abundance on the closed reef. This represents an erosion of any reserve effect and likely therefore, a decline in compliance with no-take rules. However, it is possible that the size of the no-take area is too small to produce a measurable change in the fisheries data. While scientific evidence suggests that size does not matter (Halpern, 2003), the small size of the no-take zones relative to the overall size of the CMAs (see Table 4) coupled with fishing effort may make these no-take areas too small to see a noticeable impact on exploited species of fish, even though selected benthic species and habitat seem to demonstrate a reserve effect.

Abundance of schooling fish is illustrated in Figure 8. The densities of schooling reef fish, including snappers and rabbit fish, have been higher and the recovery faster in the closed area and there seems to be an improvement in the open area as well, indicating possible spillover benefits to the capture fishery. However, no information on the statistical significance of the regression lines in figure 8 was reported in the source document. The data in figure 8 shows a different trend (increasing) compared to figure

7, which indicates a general decline in commercial fish abundance in the closed area and little changes in the open area.

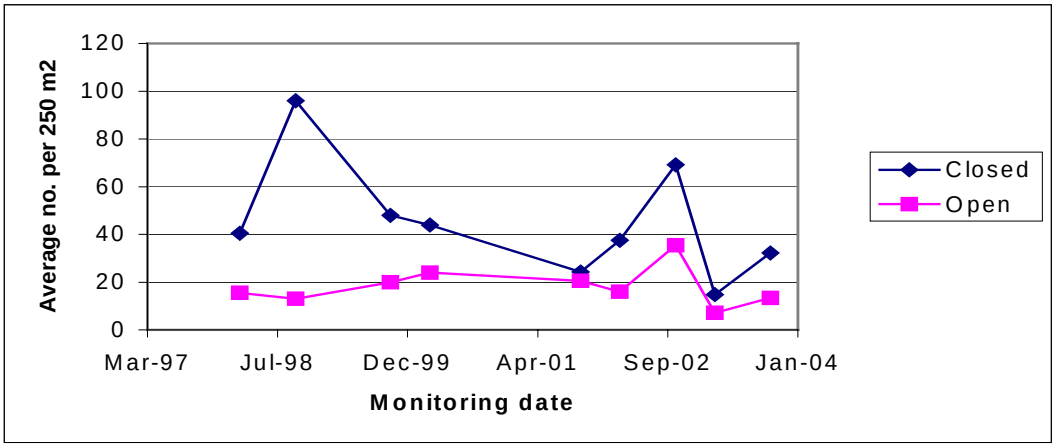


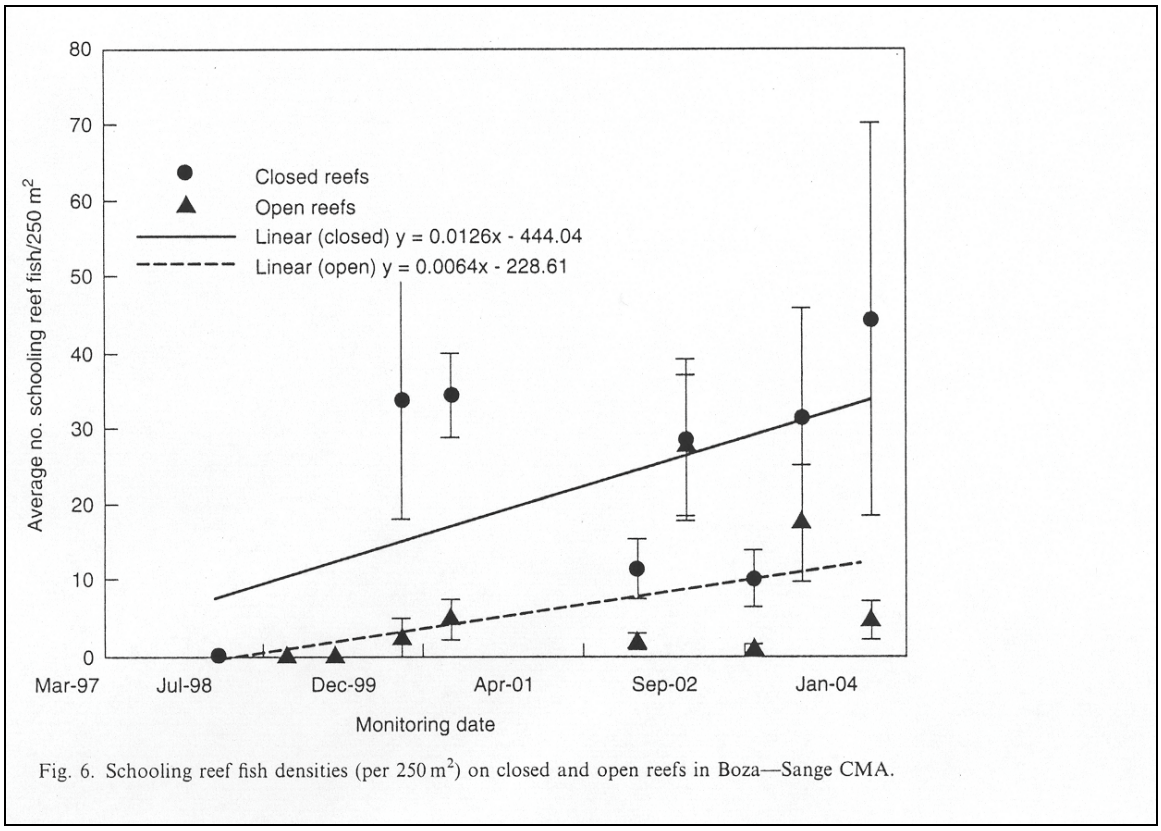
Figure 7. Comparison of commercial reef fish on closed and open reefs in the Boza-Sange CMA

Overall, the data on the marine environment suggests that the no-take zones in the CMAs are having a positive benefit on some aspects of marine biodiversity, especially on benthic habitat and reef health and particularly in the Boza-Sange and Mkwaja-Buyuni CMAs. It should also be pointed out, however, that these data are indirect indicators of biodiversity (e.g. percent live coral cover, abundance of selected indicator species) and do not measure directly any specific information on species diversity. In addition, while closed areas tend to have higher reef quality indicators, it is unclear from the secondary data provided above as to whether this is a trend that has developed over time, or that closed areas may have originally been selected due to better reef quality in the first place. Even if this is the case, the closed areas likely represent areas of higher biodiversity and therefore are better candidates for closure from a bio-diversity standpoint than that the existing open reefs. These data are also collected using community-based monitoring techniques that are considered less rigorous and exacting than "scientific" surveys. The impact of closed areas and the collaborative management regime in the CMAs is inconclusive with respect to fisheries since there are no strong signals or clear trends evident from the data.

POPULATION AND SETTLEMENT PATTERNS

Population assessments for each of the eight pilot villages were made from analysis of various available census documents, participatory exercises and mapping, and key informant interviews. Table 5 compares the population data from the 1978, 1988 and 2002 censuses, and also presents the growth rates for each inter-censual period.[4] In general, it shows that the coastal villages tend to grow faster than the inland villages. The data demonstrate variations in the growth rates between villages and inter-censual periods. At the village level, the highest growth rates in the 1978/88 period were

[4] The exponential growth formula was used to calculate growth rates. The formula states that $\mathbf{P_t=P_0e^{rt}}$, where P_t is the population at time t, P_0 is the population at the initial census, e is the exponential constant, r is the growth rate, and t is the time interval between censuses.



(Source: Verheij et. al. 2004)

Figure 8. Schooling fish densities on open and closed reefs in Boza-Sange CMA

recorded in Mikocheni (7%), Mkalamo (6%) and Mkwaja (4%). However, both Mkwaja and Mkalamo recorded negative growth rates during the subsequent 1988/2002 inter-censual period. These drops in village growth rates are largely explained by out-migration from the village (as in the case of Mkalamo), and by boundary changes (in the case of Mkwaja). The village of Mkalamo experienced significant out-migration to Handeni District after a railway bisected the large village of Mkalamo-Hadeni after the 1988 census had been conducted. Similarly, the villages of Buyuni and Ushongo, which had previously been a part of Mkwaja village, became two independent villages after the 1988 census, explaining much of the negative growth in Mkwaja.

Other villages that recorded drops in population growth rates are Matipwili and Mikocheni. The declines in these villages are likely a function of out-migration spurred by economic hardship. Specifically, the drop in Matipwili can be linked to the decline in salt production, encouraging out-migration of males between 15-34 of age to look for work opportunities elsewhere (mainly fishing in nearby villages). In Mikocheni, the decline in the growth rate accelerated after the closure of Mkwaja Ranch, which had created important employment opportunities for area residents.

[5] The exponential growth formula was used to calculate growth rates. The formula states that $\mathbf{P_t=P_0e^{rt}}$, where P_t is the population at time t, P_0 is the population at the initial census, e is the exponential constant, r is the growth rate, and t is the time interval between censuses.

Table 5. Village Population and Growth Rates for 1978, 1988 and 2002

	Population			Growth Rates	
Villages	***1978***	***1988***	***2002***	***1978/88***	***1988/02***
Matipwili	1,705	2,230	2,768	2.7	1.5
Saadani	733	810	1,907	1.0	6.1
Mkalamo	2,086	3,698	3,319	5.7	-0.8
Mkwaja	829	1,193	744	3.6	-3.4
Ushongo	-	512	760	-	2.8
Sange	815	871	1,567	0.7	4.2
Buyuni	-	185	210	-	0.9
Mikocheni	520	1,077	1,274	7.3	1.2

MIGRATION

Seasonal migration dominates population dynamics in these eight coastal villages. Throughout the year, men—mostly between the ages of 15 and 39—move between villages according to fishing and farming seasons. In Saadani, for example, the high shrimp season between February and May attracts over a thousand young men (an increase of 60%) to the coastal village.[6] In-migration to Matipwili peaks during December-February and July-October during the high salt production and pineapple harvesting seasons; and in Ushongo, high season for the tuna catch peaks during April-June. While most migrants come from neighboring villages, large numbers of "outsiders" also migrate to both Saadani and Ushongo, where the lucrative shrimp and tuna trades attract businessmen from Zanzibar, Dar es Salaam, and other large towns and cities.

As mentioned earlier, two villages have experienced significant out-migration and subsequent negative growth during 1988-2002. Mkalamo and Mkwaja have both experienced severe downturns in economic activity over the past five to eight years. Mkalamo, a farming village, has suffered four years of drought, which has resulted in low agricultural production. Mkwaja has suffered from a deteriorating fishery, due mainly to overfishing, poor quality fishing boats, and drought (fishers suggest that this has raised the average water temperature near shore thereby pushing fish into deeper, cooler water). Lack of employment opportunities and reduced incomes have ultimately led to increased out-migration, particularly of men between the ages of 15-35 years.

FERTILITY AND MORTALITY

Village-level fertility and mortality data are not available. However, fertility and mortality patterns at the community level can be inferred by using the regional and district fertility estimations that are currently available (Table 6). Overall, the table indicates that in terms of demographic indicators, the Coast and Tanga regions are better off than the national average.

[6] Saadani is the only village that attracts large numbers of male migrants in all age groups from 15-19 up to 55-59.

Table 6. Demographic Indicators for Coast (Pwani) and Tanga Regions

Demographic Indicators	Years	Regions		Tanzania (national)
		Coast (Pwani)	*Tanga*	
Crude Birth Rate (CBR)	1978	35	47	49
	1988	33	46	47
Total Fertility Rate (TFR)	1978	5.3	7.1	6.9
	1988	5.0	6.4	6.5
	2001*			5.1
Infant Mortality Rate (IMR)	1978	121	112	137
	1988	113	106	115
	2001*			104
Child Mortality Rate (CMR)	1978	204	187	231
	1988	189	176	191
Life Expectancy at Birth (LEB)	1978	47	49	44
	1988	48	49	50
	2001*			43

Source: URT (1991, 1994)
*UNDP Human Development Report (2003)

The data show that the fertility indicators for the 1978 and 1988 census were higher in Tanga region than in Coast Region. The Total Fertility Rate[7] (TFR) for Tanga was even higher than the national average in 1978 and nearly the same in 1988. Generally, fertility in both regions should be considered high, at least by the 1988 level. Data for the 2002 census are still not available.

Regarding mortality, Coast region recorded a higher infant mortality rate (IMR) and child mortality rate (CMR) than Tanga in both the 1978 and 1988 censuses. In both regions, there are signs that mortality is decreasing; though progress is slow. Overall high mortality in the two districts is reflected in a below-average life expectancy at birth in 1988. At the national level, a falling life expectancy (43 years in 2001) reflects the spread of HIV/AIDS and its devastating effects on Tanzania's population as a whole.

POPULATION COMPOSITION

Like most other developing countries, a high percentage of Tanzania's population is under the age of fifteen. In the eight coastal villages included in the PEACE Project area, 40% of the population is between the ages 0-15. Such a large proportion of young people indicates a future of rapid growth in the absence of significant out-migration. This is due to the large numbers of children who will soon enter into their childbearing years. As previously noted, however, migration plays a large and important role in the demographic make-up of the villages.

Most movement is among men in their most productive years, between the ages of 15-49. For those villages experiencing significant in-migration (Saadani, Ushongo, Buyuni),

[7] Total Fertility Rate (TFR) refers to the average number of children a woman will have in her lifetime at the prevailing fertility rate.

males far out-number females, reflected in a high male-female sex ratio. Conversely, those villages experiencing out-migration (Matipwili, Mkalamo) have a low sex ratio. An uneven sex ratio has implications for the cultural, economic and social conditions of a community.

POPULATION PROJECTIONS

Two projection tables compare population size from 2005 to 2012 by using 1) the observed village population growth rates for the 1988/2002 inter-censual period (Table 7), and 2) by using the district growth rates (Table 8) for the same period.

Table 7. Population Projections for Villages Using 1988/02 Village Growth Rates

Villages/District	Population in 2002	Growth rates % (1988/2002)	Projected Population			
			2005	2007	2010	2012
Matipwili	2,768	1.54	2,899	2,990	3,132	3,230
Saadani	1,907	6.12	2,291	2,589	3,111	3,515
Mkalamo	3,319	-0.77	3,243	3,193	3,120	3,072
Mkwaja	744	-3.37	672	629	568	531
Ushongo	760	2.82	827	875	952	1,008
Sange	1,567	4.19	1,777	1,933	2,192	2,384
Buyuni	210	0.91	216	220	226	230
Mikocheni	1,274	1.20	1,321	1,353	1,402	1,436

Table 8. Population Projections for Villages Using 1988/02 District Growth Rates

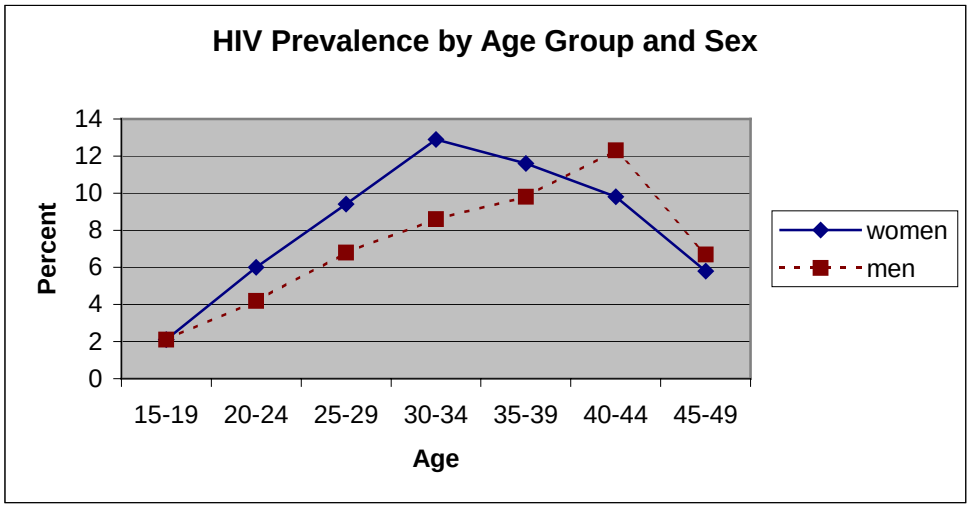
Villages/District	Population (2002)	Growth rates % (1988/2002)	Projected Population			
			2005	2007	2010	2012
Matipwili	2,768	1.97	2,823	2,936	3,054	3,240
Saadani	1,907	1.97	2,023	1,971	2,014	2,082
Mkalamo	3,319	1.10	3,430	3,319	3,319	3,319
Mkwaja	744	1.10	769	744	744	744
Ushongo	760	1.10	785	760	760	760
Sange	1,567	1.10	1,619	1,567	1,567	1,567
Buyuni	210	1.10	217	210	210	210
Mikocheni	1,274	1.10	1,317	1,274	1,274	1,274
Bagamoyo District	**228,967**	**1.97**	**242,879**	**252,620**	**267,969**	**278,717**
Pangani District	**43,920**	**1.10**	**45,389**	**46,395**	**47,947**	**49,010**
Tanzania total (millions)		**2.3% (2005)**	**36.5**		**41.8**	

The data for the two projections show no major variations in village population over the next decade. It shows that most villages have a lower growth rate than the national average. However, three coastal villages (Saadani, Ushongo, and Sange) have a substantially higher growth rate than the national average. Overall, the major influence on population dynamics should continue to be seasonal migration, as fishermen and traders move from one village to another according to season, economic environment,

and opportunities for employment. However, significant changes in the population composition and size may occur if HIV/AIDS incidence and prevalence rates continue to increase. An increase in tourism activities around the Saadani National Park may also affect population size, composition, economic diversification, and possibly HIV/AIDS prevalence in this coastal area.

HIV/AIDS

Over 1.8 million adults in Tanzania are estimated to currently live with HIV/AIDS and AIDS is now the major cause of illness and death among Tanzanian adults. HIV prevalence is estimated to be seven percent of the adult (15-49 years old) population (Tanzania Commission for AIDS, 2005). On average, it is estimated that 7.7% of all women and 6.3% of all men in Tanzania are HIV-positive. However, as shown by Figure 9, the HIV-prevalence varies significantly between age groups. The figure also shows that women are more highly affected at younger ages as compared with men. Prevalence for both women and men increases with age until it reaches a peak, which for women is attained at age 30-34 (13%) and for men at age 40-44 (Tanzania Commission for AIDS, 2005). In the Pwani region, which includes the Bagamoyo district, the prevalence rate among women is almost three times that of men (10.5% vs. 3.9%). In the Tanga region, which includes the Pangani district, women are twice as likely to be infected than men are (7.4% vs. 3.2%). Hence, in the PEACE project area, the data suggests that HIV-prevalence is much higher among women than men (Tanzania Commission for AIDS, 2005).



Source: Tanzania Commission for AIDS, 2005

Figure 9. HIV Prevalence by Age Group and Sex

HIV/AIDS cases are heavily under-reported. Nationally, it is estimated that only one out of five cases are reported. This is due to under utilization of health facilities (case diagnosis/statistics are only done in hospitals) and under diagnosis (most clinicians are not trained in clinical AIDS diagnosis). Under-reporting of AIDS cases is not due to limited testing facilities since AIDS diagnosis in Tanzania is not done through testing, but through clinical diagnosis. Health facilities in the project area that can provide case diagnosis are limited to Pangani and Bagamoyo district hospitals, located from 15 to 60 kilometers from the villages. Transportation is difficult and unreliable. The other form of

testing—anonymous unlinked HIV testing—is only done for surveillance purposes to monitor the trend of HIV prevalence in the country. Blood donor HIV- prevalence in Pangani district in 2004 was 4.7 % on average (Pangani district records).

Because of the stigma associated with AIDS and the difficulty in reaching health facilities, very few people seek diagnosis. In the Tanga region, 16% of women and 20% of men have been tested for HIV — in Pwani the figure is about 16% for both women and men (Tanzania Commission for AIDS, 2005). We found that individuals in three of the seven interviewed HIV-affected households had been tested for HIV. This higher percentage may indicate that the family members already suspected that they were sick. Stigma is very common particularly in rural communities where there are many misconceptions and misunderstandings about how the disease is transmitted. Many people fear all forms of contact with people living with HIV/AIDS even though normal daily activities are not a source of infection. For example, the Tanzania HIV/AIDS indicator survey found that 48% of respondents would not buy fresh vegetables from a shopkeeper or vendor who was HIV-positive. Stigma has devastating consequences not just for the infected but also for their families and the wider community. Women risk being divorced, even ostracized, after being diagnosed with HIV, and for this reason, few choose to undergo testing. People who may be infected are reluctant to have an HIV test and to tell others of their status. One interviewee mentioned that people are afraid to get tested because they think that the results might be disclosed in the village. As a result, the disease continues to spread and people delay seeking appropriate health care.

Voluntary counseling and testing (VCT) is being provided in the districts to facilitate behavior change through the counseling component and to provide an entry point for care and support services. This is why it is important to have VCT services widely available and accessible to the population. In Pangani, VCT services are being offered at the District hospital and at an NGO-run site (Tanga AIDS Working Group-TAWG) in Pangani town. A total of 350 people were counseled and 344 tested through the VCT services at the Pangani District hospital in 2004 (Pangani District records). HIV-prevalence for those tested was 17% for males and 29% for females. Matipwili village health center provides VCT services for pregnant women. It is the only village in the project area to offer any VCT services. In 2004, 39 pregnant women were tested for syphilis and HIV at the Matipwili health center through its VCT program for pregnant women. Ten percent tested positive for syphilis and five percent tested positive for HIV.

Trained health workers were interviewed in six of the eight villages within the Project area. According to the health workers, HIV-prevalence is not known due to low HIV diagnosis and testing rates. Key informant interviews reveal that villagers—including women, religious leaders, traditional healers, and health workers—agree that despite improved access to basic health services in several of the villages (through the establishment of village dispensaries and first aid stations), community health continues to decline. Deteriorating health in the community is attributed mainly to an increase in cases of HIV/AIDS and other sexually transmitted infections (STIs), tuberculosis, pneumonia, diarrhea, and skin diseases. Malaria continues to be one of the most common and serious illnesses in the area. Children under the age of five years are especially vulnerable to the disease and mortality is high in this age group. In the village of Matipwili alone, four children under age five years died of malaria during a two-month period at the end of 2004.

Some individuals who are sick receive home-based care—either by a trained health extension worker, who can provide patients with antibiotics and anti-fungal medicines on a regular basis, or a by a family member, who often does not have even these basic medications to administer to the sick. Many of those receiving home-based care have returned to their village of birth after becoming sick in urban centers, including Dar es Salaam. Confined to their homes, the HIV status among this group of returning migrants remains unknown but is believed to be high. In Pangani there is a home-based care program coordinated from the district hospital. A local NGO (TAWG) also provides some care for chronically ill patients. Five of seven HIV/AIDS-affected households maintained that they were currently enrolled in or had received some form of home-based care from TAWG or from the National AIDS Control Program.

TRADITIONAL MEDICINE

Traditional medicine continues to play an important role in the health of the residents of this coastal region, particularly for women, and visits to traditional healers are common. Traditional healers are viewed as especially important for treating problems of fertility, including difficulty conceiving, miscarriage, and impotence. Most traditional medicines are derived from the roots, leaves, and bark of indigenous plants, but traditional healers declined to identify specific species. There is some concern about the depletion of particular trees of medicinal value in areas outside the Saadani National Park. No animal parts are used in traditional medicines in this area of Tanzania. Other traditional treatments mentioned by healers include invocation of prayer, the power of the Quran, and the use of charms.

Most traditional healers admit freely that they cannot treat AIDS effectively, but interviewees mentioned that they still value their advice and treatments. One man relied solely on traditional healers — refusing to use other treatments. Seeking treatment for symptoms of AIDS at a health center is often a last resort—after medicines from the traditional healers have proven ineffective—necessitating an immediate referral to the nearest hospital.

Informants expressed a growing concern that what was once mostly a “city problem” is quickly becoming a village problem. With increased mobility now possible due to newly constructed roads, and with lucrative business opportunities in fishing, the salt-making, trade, and road construction continuing to attract transitory, relatively wealthy men to the area, HIV/AIDS incidence (number of new cases) is expected to increase in the near term.

MOBILITY AND HIV/AIDS

Research in Africa has long demonstrated that the prevalence and patterns of the spread of infectious diseases are closely associated with patterns of human mobility (Drimie, 2002). People become more vulnerable to HIV/AIDS when their work takes them away regularly from home and family. With fewer social ties and lack of social cohesion in settings away from home they are more likely to do things that they would not if they were at home, including engaging in new sexual contacts. Many are ill-informed about condom use and HIV/AIDS in general, which leads to misconceptions that in turn result in decreased condom use.

The optimal context for HIV transmission is one where men have money, have few recreational options, are away from families, and are amid low-income communities where women's limited access to education, employment, credit or income can force women to resort to commercial or transactional sex. This is the reality in the rural fishing communities strung along the coast of Pangani and Bagamoyo districts.

Women in these small coastal villages are experiencing a decline in viable options for decent livelihoods, and are turning in increasing numbers to exchanging sex for money from migrant fishermen and businessmen who often take up residence in their villages for months at a time. For example, during the high fishing season from March to June, migrant fishermen and businessmen (very few migrants are women) pour into Saadani village, swelling the population of the village from 1,900 to 3,000. Informants were well aware of women (of all ages) pursuing sexual relations with this wealthy, mobile group of men.

Studies in Africa have found that fishers are particularly susceptible to infection of HIV/AIDS and more vulnerable to the impacts (Bishop-Sambrook and Tanzarn, 2003). To illustrate this point, Bishop-Sambrook and Tanzarn (2003) constructed a matrix of different fishing community members' susceptibility to HIV/AIDS infection and their vulnerability to the disease's impacts. The matrix, constructed on the basis of a subjective scoring system, shows fishers to be the most susceptible and vulnerable to HIV/AIDS (Figure 10).

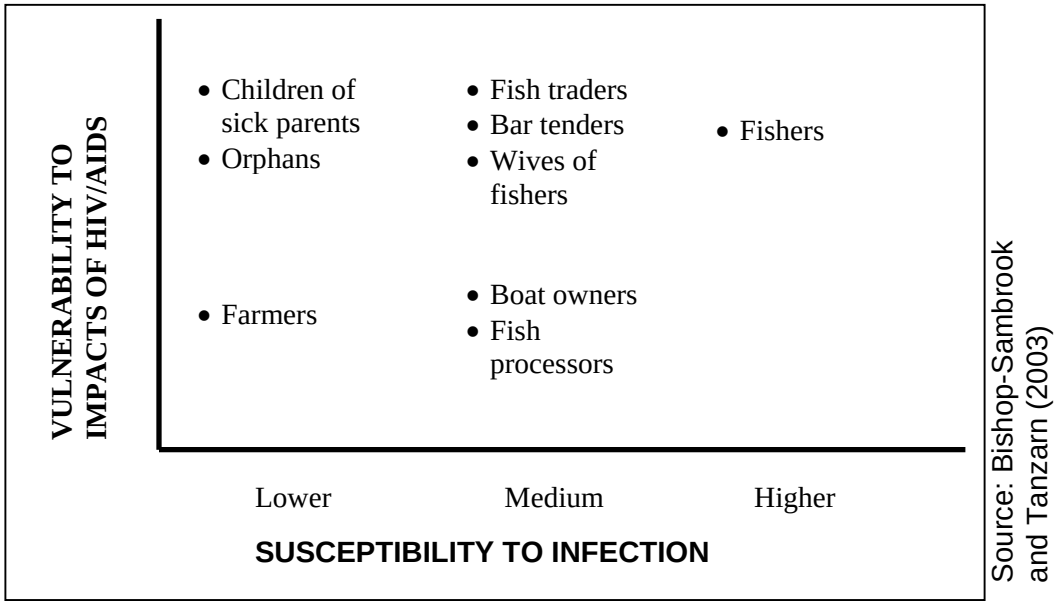


Figure 10. Profession and vulnerability to HIV/AIDS

Fishing communities in the project site include young men who make up boat crews, fish traders who buy and sell fish (either as agents for a fish company or operating as a small business transporting the fish by bicycle to a market town), and fish processors (women who buy and process fish by frying, salting and sun-drying within the community). People flow into and out of landing sites daily to trade in fresh fish and there is semi-permanent migration into fishing communities for approximately four months of the year. Migrant fishers may spend three or four months away from their home village to follow

the seasonal movement of the fish. Other migrants, mostly from inland areas, are attracted to the prospects of earning a daily wage in the fishing, salt-making, or trading businesses. This hub of activity attracts various elements from the service sector, such as bars, eating places, lodges, beer brewing and commercial sex work.

Although certainly not all migrant fishermen seek out commercial or transactional sex, the majority of those who do often place themselves and their partners in highly risky situations by being inebriated, having multiple sex partners, and using condoms inconsistently or not at all. During the fishing season fishers earn cash on a daily basis, which is easily spent on alcohol and sex when living away from home. They also have a significant amount of free time, as fishing activities usually take place in a three to five hour time span in the early morning or evening. Interviews with members of communities in the Project area confirm that alcohol consumption, by both men and women, is high; that bars and restaurants are popular entertainment spots; and that taking multiple sex partners and paying for sex are common occurrences.

Residents of the two inland farming villages, Matipwili and Mkalamo, are also susceptible to HIV infection through contact with outsiders. These villages are located next to train stations. The Sea Salt Works south of Saadani village transports and stores salt at the railway in Matipwili, attracting large numbers of migrant workers on a seasonal basis.

The village of Ushongo, where residents' daily lives are regulated by exceptionally strong religious and social norms, appears to be something of an exception. Unacceptable behavior is not tolerated and offending individuals are asked to leave the community. There are no bars and alcohol is rarely consumed (although it is well known that quite a few males who reside in Ushongo regularly visit bars in Mwera village, which is just a few kilometers away). These factors have helped to lower the risks for HIV infection in Ushongo. However, the increasing mobility of migrant fishermen and businessmen is narrowing the link between people in areas of high HIV/AIDS prevalence and those, like Ushongo, in low prevalence areas. Villagers worry about the impacts that increasing numbers of migrant fishermen and traders will have on their tightly knit community and now consider it extremely important to raise awareness about HIV/AIDS in order to maintain the health of the Ushongo community.

GENDER AND HIV/AIDS

HIV infection levels tend to be higher among women than men. The proportion of adults living with HIV/AIDS who are women is approximately 58 percent in Tanzania. But as described previously, women are three times more likely than men to be infected in the Pwani region and two times more likely to be HIV positive in the Tanga region. Globally, in the age group of 15 to 24, two women are infected for every one man. In Tanzania, there was a two-fold increase in HIV prevalence—from 7.2 to 13.3 percent—among female blood donors during 1990 to 2000. Reasons for the increase in the rate of infection among women include physiology, socio-economics and violence, all of which are compounded by gender constructs within cultures.

Women and teenage girls are believed to be especially vulnerable to HIV infection for biological, social, and cultural reasons. Girls living in coastal Tanzania marry at a very young age, often just after their first menstrual bleeding (12 or 13 years old). Cultural and religious norms allow men to take several wives and young girls are often married to elderly wealthy men. The dowry is the driving motivation for parents to marry off their young daughters, which means the end of the girl's education. Polygamy puts women in a vulnerable position — in Tanzania as a whole, women who are in polygymous unions have a HIV/AIDS infection rate of 9.9% vs. 6.6% for women in non-polygamynis unions (Tanzania Commission for AIDS, 2005). Furthermore, women are more likely to be asymptomatic of sexually transmitted infection (STI) and less likely to seek treatment for STIs—resulting in chronic infections with more long-term complications. Untreated STIs increases the likelihood of HIV infection.

J. Tobey

Women's group weaving mats in Saadani

Poverty has also played a major role in the spread of HIV among women in the project area. Women (both married and unmarried) use sex in exchange for gifts, money, and other support to supplement their small income. Other women have migrated to urban areas in order to achieve economic and social independence. Lack of education, however, restricts many of them to the informal trading sector of domestic work, or sex work.

Villagers, especially women, have begun to experience the negative effects of caring for sick family members in terms of increases in both work burden and household expenditures. The scenario interviews showed that women normally are the caregivers if someone in a household becomes ill. If a man becomes sick, his wife has to take care of him — if a woman becomes sick, a daughter will have to take care of her (or another female relative or neighbor if there are no daughters). In some households, if a woman becomes terminally ill, the husband sends the wife (and their children) back to her parents.

When women have to spend more time caring for sick people, they will have decreasing amounts of time to earn cash income outside the home, often leading to a cycle of poverty and sickness. Women in the village of Sange reported that women "sleep with anyone if he has money, because life is hard, sometimes we don't have time to work, and our husbands drink their money away." Speaking frankly, the women continued, "We are afraid to know our HIV status, because knowledge will hasten death, and our husbands will divorce us before we die."

A woman in the village of Mkwaja explained further that women accept the fact that it is the "female burden" to provide for her children, so when a woman prostitutes herself, "she risks dying for the sake of her children." Sentiments such as this contrast sharply to

men's perceptions of why and how women prostitute themselves in these isolated coastal villages. For example, in an all-male focus group, men reported that "women chase after men" and women "have low moral standards."

As a result of the gendered power relations in the rural pilot villages, women are more vulnerable to the social and economic impacts of HIV/AIDS. Inequalities in access to land (inheritance rules), credit, employment, education and information all make women more vulnerable to negative outcomes. Furthermore, women carry the main burden for caring for the sick—thereby reducing their ability to engage in productive labor. This includes young girls who drop out of school to help their mothers cope with their increasing workload at home. Apart from the time lost for care, considerable household resources are lost to pay for treatment and medicines. Women are the main sufferers who have to make up for these losses.

Due to this context of poverty and structural gender inequality that exists in the Project area, women are uniquely vulnerable to HIV/AIDS. But men are also affected by the existing gender relations and prevailing power structures within their communities. Working environments in this coastal area, such as that of the mineworkers, construction workers, fishermen, and traders, may contribute to male notions of masculinity and sexuality. Next to boredom and loneliness of these jobs, the men endure dangerous and unpleasant working conditions, poor accommodation and estranging environments, to which they may respond with exaggerated "masculinity" and sexual bravado. Alcohol consumption is extremely high in these fishing communities, and taking multiple sex partners and hiring women for sex are common and socially acceptable. Poverty, limited access to secure employment and limited education exacerbate the situation.

Understanding the different perceptions, roles, and responsibilities of men and women—and the culturally constructed power relations between them—is crucial for effectively addressing the root causes of risky sexual behavior. The HIV/AIDS epidemic is now embedded in the lives of these coastal men and women, and impacts not only the communities' health and economic well-being, but it may be threatening the surrounding natural environment. This is the theme of the next section.

LIVELIHOODS AND THREATS TO BIODIVERSITY

LIVELIHOODS

Livelihoods in all eight pilot villages in the PEACE project area are highly dependent on the natural resources in the area—agricultural land, common property natural resources such as marine and freshwater fish, coconut and cashew trees, and forests. Several of the villages in the Project area are nearly totally dependent on a single livelihood—fishing or farming. But because both agriculture and fisheries are currently suffering from a decline in productivity and profitability, these communities are at risk of increasing poverty and severe food insecurity in the near and long term.

There is little physical infrastructure and few social services in the villages. All roads are unsurfaced and many become impassable during the rainy season. There is no piped water. Five of the eight villages have no electricity. Electrical lines were installed in Mkwaja five years ago. However, only a small number of homes are connected. Ushongo Mtoni sub-village and the Makolola sub-village of Sange village also have

electricity. Health and education services are also minimal. Saadani is the only village with a secondary school. Matipwili, Saadani, and Mkwaja have health centers, or “dispensaries”. The villages of Ushongo and Sange have first aid stations, but they do not have regular staff or a reliable supply of medicines. Walking or bicycles are the primary means of movement. There are no motor vehicles (motorcycles or cars) as far as we could determine.

Table 9 summarizes major livelihood activities in the Project site. Artisanal fishing is by far the most important economic activity in the coastal villages in the project area (Saadani, Mkwaja, Ushongo, Buyuni, and Sange) involving about 70-80% of the male population. Fishing households harvest a great diversity of species: fish (especially, rabbit fish, emperor fish, rays, groupers, prawn during season), octopus, sea cucumbers, spiny lobsters, shells, corals and prawns/shrimp. The fishery is largely coral reef-based, occurring within 15 km of shore. Men do most of the fishing but a few women fish in shallow waters for shrimp; process and market fish; and collect octopus and mollusks at low tide. According to TCZCDP, there are about 512 specific fishing grounds recognized by fishers, of which 112 have been identified as belonging to CMAs. For example Boza-Sange has 40 fishing grounds.

Fishers tend to prefer using grounds closest to their villages, although there is considerable movement up and down the coast. Fish are landed at specific sites, mostly government designated sites, which helps in monitoring fish catch. In terms of fishing gear, the most commonly used are gill nets, seine nets, long lines and fish traps. The most common fishing platform in the Project sites is the sailing outrigger canoe (*ngalawa*).

The shrimp fishery is particularly important to the Project villages. In Saadani, for example, it is the main fishery. There are two seasons for shrimp. The high season is from March to May (*kusi*) and the short season is from October to November *(maleleji)*. The end of the shrimp fishing season in Saadani marks the end of any significant economic activity. Therefore for five or more months fishers are relatively inactive (a small number of fishers migrate southwards to continue fishing for shrimp). The income from fishing across the fishing villages in the study area is low. In all cases, fishers and their families are unable to save money and live in a continual condition of insecurity. Declining fish abundance and catch, poor boats (unable to fish deeper waters), lack of engines and equipment are given as primary causes of continuing low return. None of the boats in the project area have outboard engines.

In the coastal villages, fertile land is scarce and there is little to no farming activity of food crops aside from coconuts and cashew nuts. Most of the potential arable land is within the boundaries of the National Park and therefore cannot be cultivated. There are also severe problems of crop losses from wild animals especially in villages that border SANAPA (Saadani, Buyuni, Mkwaja, and Sange). In the village of Sange, crops like maize, cowpeas, simsim, and rice have been affected by drought and informants report that there have been food shortages for several years. In most coastal villages, people depend on imported agricultural goods from neighboring inland villages and from urban areas.

In the three inland villages (Matipwili, Mkalamo, and Mikocheni), farming is the primary livelihood. Matipwili village is privileged to be located along the fertile shore of the Wami River, the only river in the region that flows throughout the year. Corn and peas are

grown in the period of low rains and rice is cultivated during the rainy season when the fields are flooded. Other crops include plantains, pineapples and cassava. Mkalamo and Mikocheni are experiencing periods of extremely low production in agriculture. In Mikocheni, the PRA exercise found that there have been food shortages for several years. Food insecurity is due to recurrent drought, damage from wild animals, and lack of interest in agriculture among the younger generation.

The Msangazi River crosses Mkalamo village. In the past, the river flowed year round, but since 1998 it has become seasonal with water flowing only during a limited period of the year when there is heavy rain. At the time of the visit in early February, the river was completely dry. Due to drought conditions over the past four years and the drying up of the Msangazi River, the village has experienced food shortages for several years. Villagers are now dependent on imported food supplies.

Table 9. Primary and secondary livelihood activities in the villages

Village	Primary Livelihood	Secondary Livelihoods
Matipwili	Farming (corn, peas, plantain, rice)	Fishing (Wami river) and fish processing, house building, selling water, carpentry, tailoring
Saadani	Fishing (primarily shrimp). About 100 fishers	Salt making, firewood cutting, producing and selling local brew and selling meals and beverages during high fishing season
Mkalamo	Farming (corn, rice, peas, simsim, coconuts, cassava, sesame, pineapples, oranges, and cashews)	Fishing in ponds, livestock, charcoal making, food processing, house building, carpentry, tailoring. Women operate small businesses to supplement household income: making and selling mats, selling meals and beverages, selling vegetables and fruits.
Mkwaja	Fishing (22 sailing outrigger canoes and 140 fishers)	Farming (coconuts, cashew nuts), seaweed farming (150 seaweed farmer; 90 percent women)
Ushongo	Fishing (30 sailing outrigger canoes and 120 fishers)	Coconut farming, seaweed farming
Sange	Fishing	Agriculture (crops, coconuts, cashew nuts), seaweed farming, charcoal making
Buyuni	Fishing	Agriculture (coconuts, cashews, cowpeas and other non-cereal crops)
Mikocheni	Farming (coconuts, cashews, cassava and rice)	Fishing, charcoal making

Other livelihood activities in the project site include salt making and salt storage (Saadani, Matipwili), charcoal making (Mkalamo, Mikocheni, and Sange), seaweed farming (Mkwaja, Ushongo, Sange), and other small business activities (making and selling mats and baskets, running small “hotels”, preparation of simple meals for customers and sale of beverages, drying and selling fish, selling water and fuelwood, and making and selling of local alcohol). Small and large-scale salt production involves cutting of mangrove trees to provide space for drying reservoirs for large-scale salt

works and cutting of fuelwood for small-scale salt works involving boiling. Large-scale salt works cover approximately 1000 ha employing about 365 staff, some of whom stay in campsites close to the salt works.

TOURISM

The PEACE pilot area —with the Saadani Park, the Maziwe reserve, and the sandy beaches of Pangani—has great potential for tourism. There are several hotels adjacent to the pilot villages. For example, there are two tourist facilities just to the north of Saadani village—the Saadani Lodge and SANAPA facilities. The SANAPA facilities include two buildings, one with three rooms and six beds, the other with two rooms and three beds. The Saadani Lodge has cabanas for about 20 guests but it is reported that the occupancy rate is low. The lodge has several powerboats for sport fishing or snorkeling. Even this low-level tourism has impacts on the village. We observed the Saadani Lodge vehicle in the village buying fish and other supplies. We were also told that some of the men working at the Lodge are from Saadani village. Both the Saadani and Matipwili villages have airstrips to fly in guests by small plane. In Matipwili, the airstrip was constructed by the owner of a safari camp (Sanctuary (T) Ltd. Kisampa Camp) located on the southwestern parts of the village.

Ushongo is an area of tourism growth linked to the environmental attractions of the beach and sea and nearby Saadani National Park. The beach is sandy throughout this part of the coastline and the sea is calm due to the protection of fringing reefs. Just to the north of Ushongo Mtoni are three small beach resorts (Ushongo Beach Resort, Emayani and Tides) each with a capacity of about 20 guests. The village receives five percent of annual hotel income for village development. There is a small airstrip, a new diving center adjacent to Ushongo Mtoni, and a marina and guesthouse are planned for construction. Tourism is still low in the area, but there is potential for significant growth over the medium to long term.

THREATS TO BIODIVERSITY

The importance of natural resources to livelihoods and household survival strategies is underscored by people's perception of key problems. Table 10 shows that the majority of key issues and problems in the Project site are related to natural resources—marine fisheries, common property forest resources, near-shore marine resources for seaweed farming, and agricultural land and water resources.

J. Tobey

Fisherman mending his nets in Saadani

Table 10. Primary problems and issues in the pilot villages

Inland Village	Key Issues
Matipwili	• Land boundary conflicts with neighboring villages and SANAPA • Declining fish catch in the Wami River and nearby ponds • Distance to collect fuelwood
Mkalamo	• Distance to collect fuelwood (greater than 3 km) and time spent to gather wood (sometimes more than 6 hours). Women collect fuelwood every day, leaving in the early morning and returning in the early afternoon. Neighboring forests are now protected under SANAPA. • Drought for four years, declining agricultural production and food shortages.
Mikocheni	• Food insecurity due to destruction of agriculture by wild animals from SANAPA and drought • Declining coconut farm productivity and marketing problems • Difficult to obtain poles for construction since Mkwaja Ranch was appropriated by SANAPA
Fishing Village	**Key Issues**
Saadani	• Declining fish catch due to overfishing by trawlers and artisanal fishers • Scarcity of arable land for farming, destruction of crops by wild animals from SANAPA, and reduction of available land due to SANAPA
Mkwaja	• Declining fish catch due to poor fishing boats and gear, overfishing, and drought (increased water temperature, pushing fish to deeper waters) • *Cottonii* seaweed disease and die-off and low price of *spinosum*
Ushongo	• Declining fish catch due to overfishing and poor fishing gear • Beach front property sales and loss of coconut resources • *Cottonii* seaweed disease and die-off and low price of *spinosum*
Sange	• Declining fish catch • Declining agricultural production due to drought (3 years), destruction of crops, coconut trees and cashew nut trees by wild animals from SANAPA, and food shortages • *Cottonii* seaweed disease and die-off and low price of *spinosum* • Fuel collection danger due to presence of dangerous animals
Buyuni	• Declining fish catch due to overfishing (trawlers) • Agricultural destruction due to wild animals from SANAPA • Distance to collect water (10 km) and danger of wild animals • Lack of primary school and burden to send children to Mkwaja or Saadani • Absence of transportation and closure of Madete beach (SANAPA). If strictly enforced this will mean 18 km walk to reach neighboring Mkwaja village • Difficulty in collecting fuelwood due to dangerous wild animals from SANAPA

Declining fish abundance and catch is the primary problem in the five fishing communities. For example, the shrimp catch in Saadani has declined from over 100 kg per fisher per day in the 1970s to just 5-10 kg in recent years. In the current high season (March and April), the catch was reported to be about eight kg per fisher per day. Declining availability of fuelwood and wood for construction was identified as an important problem in Matipwili, Mkalamo, and Mikocheni. Disease and die-off of cultivated seaweed (*Euchema Cottonii)* are problems in Sange, Ushongo and Mkwaja[8]. Agricultural damage from wild animals and problems in gathering wood and water due to wild animals are prevalent in Mikocheni, Saadani, Sange and Buyuni.

The causes of and the threats created by these resource problems are summarized in Table 11. The main reasons given for declining fish abundance and fish catch are overfishing, drought, and poor fishing equipment. Fishers perceive that because of drought, the inshore water is warmer and they therefore move to deeper water to fish. Poor fishing equipment means that fishers can not go far to sea nor can they go for long periods of time. Further, fishers are dependent on the wind, have limited ability to sail in the direction of the wind, have limited nets and gear, and do not have engines or refrigeration.

Ushongo and Sange are part of the Boza-Sange Collaborative Management Area (CMA). Mkwaja, Mikocheni and Sange are part of the Sange-Mkwaja-Buyuni CMA. We were informed that the Fisheries Management Plans are being implemented as designed, and the reef condition and fish abundance in closed areas are improving. However, the monitoring data suggest that the fishery overall is not improving. There is no significant increase in fish stock. The main problem is claimed to be the impact of fishers from other regions, especially Zanzibar. Fishermen from Zanzibar use scuba gear to harvest lobsters and use ring nets with motorized boats to harvest sardines (*dagaa*). The harvest of sardines is viewed by fishers as damaging to the food cycle of larger fish (such as tuna and kingfish), that rely on the sardines as a food source. We were also informed that there is poaching at Dambwe and Maziwe reefs by fishers from Tanga and Zanzibar, especially on Saturdays and Sundays when there are no patrols.

A severe problem for the small-scale fishery, especially noted by the fishers in the villages of Saadani and Buyuni, is the effect on fish stocks of the commercial shrimp fishery. Trawlers come to the area during the shrimp season from the port of Dar es Salaam. There is fleet of some 19 trawling boats owned and operated by several companies. These boats have the capacity to exhaust local fish stocks to the detriment of the livelihood of small-scale fishers. Their presence is also associated with damage to seagrass beds and sea turtle kills. Trawling also result in a large by-catch of juvenile fish and smaller species of fish targeted by small-scale fishers.

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[8] From a price perspective, it makes economic sense for farmers to grow *E. Cottonii* because it brings in a higher price (about 200 Tsh per kilo) than the more commonly grown *Eucheuma Spinosum*. The selling price has been rising due to an increased demand for *E. Cottonii*. The problem, however, is that *E. Cottonii* is difficult to grow. Most of the farms are located in intertidal areas where salinity and temperatures fluctuate widely and are subject to freshwater inflows from nearby creeks and rivers. *E. Cottonii* requires a narrow range of temperature (25-30 degrees Celsius) and salinity (30-35 parts per thousand).

Table 11. Natural resource and biodiversity threats in the pilot villages

Inland Village	Key Resource Threats
Matipwili	• Overfishing the Wami River and ponds parallel to the river • Deforestation due to population growth, expanding settlements, conversion of forest land to agriculture, fuelwood extraction and home construction • Water contamination
Mkalamo	• Deforestation due to population growth and conversion of forest land to agriculture, fuelwood (domestic use and sale) and charcoal making.
Mikocheni	• Deforestation caused by charcoal making, tree cutting for construction, and agricultural expansion • Destructive fishing practices (use of poison and small mesh nets)
Fishing Village	**Key Resource Threats**
Saadani	• Overfishing (declining catch of shrimp) • Deforestation due to salt making, charcoal production and fuelwood extraction
Mkwaja	• Overfishing and number of fishers from outside the Mkwaja-Buyuni-Sange Fisheries Management Plan • Deforestation from illegal logging and charcoal making • Beach erosion
Ushongo	• Overfishing and declining fish catch • Poaching by outside fishers of reefs in the Boza-Sange Fisheries Management area and lack of enforcement capacity (ring-net fishing for sardines, scuba fishers for lobsters) • Declining productivity of coconut trees
Sange	• Deforestation outside of mangroves caused by tree cutting for charcoal making, fuelwood and poles for home construction • Destructive fishing practices (poisons, spears and Juya)
Buyuni	• Overfishing (commercial trawlers)

LAND-USE CHANGES

Land use and land cover changes between 1990 and 2000 were analyzed (see Table 12) using data from Landsat images. The amount of bare soil inside the Park increased by over 192 sq. km. between 1990 and 2000, while the area of grassland decreased by a similar amount. This trend is also seen in the area outside the park but to a lesser degree. This change may be due to long-term changes in rainfall. PRA participants reported drought as a serious issue occurring over the past five years. Drought coupled with possible overgrazing by wildlife may explain the large difference inside the Park. However, since multiple Landsat images used in this analysis were taken at varying times of the year, the observed differences may be affected by seasonal fluctuations.

The data also shows that the amount of agricultural land outside the Park (all land types with crops and cultivated lands) has increased by 76 percent. This is attributed primarily

to increases in bushland with crops and woodland with crops. At the same time, there has been a large decrease in the area of open and closed woodlands outside the Park. This transition from woodland to cultivated land suggests an increase in woodcutting for firewood and/or clearing of woodland for agricultural purposes. The data is consistent with the findings of the PRA where participants maintained that expanding agriculture and deforestation were key resource issues in many of the villages. Overall, land with crops also continues to expand within the Park but to a much smaller extent than outside the Park. However, if these trends continue and population continues to expand, pressure on conversion of natural lands to cultivated lands both inside and outside the Park will continue to increase.

Table 12. Land use and land cover (LULC) changes between 1990 and 2000

Land Type	Changes Inside SANAPA (sq. km.)	Percent Change	Changes Outside SANAPA (sq. km.)	Percent Change
bushland w. crops	**14.24**	**18**	**89.79**	**982**
dense bushland	-4.51	-15	-32.69	-34
open bushland	-14.97	-9	27.07	15
bare soil	**192.19**	**220**	**6.42**	**22**
cultivated agriculture	-0.74	-38	-1.09	-3
cultivated trees	34.44	93	-6.63	-10
forest - mangrove	-5.04	-33	-0.28	-2
natural forest	-4.03	-11	-3.80	-6
grassland	**-197.11**	**-52**	**-10.20**	**-8**
grassland with crops	-3.38	-3	-8.26	-10
grassland temporarily flooded	3.63	16	-2.63	-26
sandy beach	-0.36	-31	-1.45	-35
salt crust	-1.82	-62	0.35	-6
urban/settled	0.37	0	0.71	83
closed woodland	-1.01	-9	-37.89	-47
woodland with crops	**-30.77**	**-43**	**125.85**	**163**
open woodland	**13.61**	**137**	**-147.62**	**-95**
Land w/ crops*	***13.79***	***5***	***199.66***	***76***

*Summed total of woodland with crops, grassland with crops, bushland with crops, cultivated agriculture and cultivated trees.

GENDER AND LIVELIHOODS

Despite women's significant contributions to household and resource management, women have little decision-making power and suffer from a very low status relative to men throughout the Project area. Women participate in limited numbers in women's group activities and occasionally hold membership in a village committee; but generally, women do not participate fully in local political organizations and are largely left out of the community leadership. Furthermore, despite a newly enacted national law guaranteeing a Tanzanian woman's right to inherit land and property after the death of her husband, women in these coastal villages are denied this right.

> If a woman becomes terminally ill, the husband tends to send her and their children to the woman's parents. The husband continues to support them financially, but when the situation becomes worse, he usually forsakes the woman and children and marries a new wife. (scenario interview — Saadani village)

Women in this coastal area of Tanzania have primary responsibility for rearing children and ensuring sufficient resources to meet family needs. Women also are the main managers of essential household resources like water, fuel for cooking and heating, and food for household consumption. Despite these significant responsibilities, the male head of household makes most decisions concerning income expenditure, labor allocation, health care provision, food production and acquisition (both agriculture and fishing), and mobility of family members. Access and control exercises, which were carried out in four of the eight coastal villages, were particularly informative, revealing deeply embedded inequalities in access to income, transportation, educational opportunities, and political representation.

Over the past decade, women have been forced to devote more time to income-generating activities for three main reasons: limited access to cash income earned by men, an increased number of female-headed households, and increased expenditures on food and health care. Women reported that while women use their cash income on family expenses—food, medicines, school fees, etc., men spend their cash on "their individual wants." Women may never see the money that is earned by men (or goods purchased with this money), and are expected to say nothing of it. As a result, women have become more entrepreneurial and have adopted coping strategies in an effort to retain some control over at least a portion of household income.

The PRA exercise showed that in many of the villages there has been a steady increase in female-headed households over the past five to ten years resulting from divorce, separation, and widowhood. Women reported that women now head most households in Mkalamo. This may be partly attributed to HIV/AIDS as well as a general dissolving in rural areas of social bonds as a result of stress and changes in agrarian livelihood opportunities (Bryceson, 1999). The result is an increase in female marginalization and a rise in poor and vulnerable female-headed households.

Table 13. Women's' Income-Generating Activities in Selected Pilot Villages

Village	Activities
Matipwili	Fish frying and marketing in village and outside, water collection and sale, selling beverages and preparing simple meals for customers
Saadani	Selling beverages and preparing simple meals for customers, collecting and selling firewood, making and selling local brew, fish processing and marketing
Mkalamo	Water and firewood collection for sale, hair plating, mat making
Mkwaja	Fishing in shallow water for small fish, seaweed farming, fish processing and marketing, making and selling local brew, buying charcoal and selling it to middlemen, making and selling woven mats and baskets, selling vegetables, chapatti, donuts, and other snacks.
Ushongo	Seaweed farming, buying, processing, and marketing fish, fishing from the beach for small fish for family consumption, making and selling thatch, running small hotels

Seaweed farming, once a lucrative business in Mkwaja and Ushongo and enthusiastically embraced by women, is now in decline. One reason for this is seaweed die-offs, the suspected cause of which is rising average water temperatures. Coconut and cashew farming—two other popular income-generating activities in several of the villages—are also no longer viable as income-generating businesses. In this case, it is a result of the combination of disease and neglect, loss of ownership and access, and foraging by wild animals which has largely decimated the coconut and cashew crops. The PRA exercise also found that women in coastal villages such as Saadani, Mkwaja, and Buyuni fish by foot with cloth in shallow water along the shore for small prawns and small fish. These small fish are used for household consumption.

To compensate for the decline in these activities, other strategies for income-generation have been developed. This includes working harder and longer in farming, fishing, and fuelwood and water collection (so "extra" fuelwood or water can be sold); engaging in alternative, non-traditional income-generating activities such prawn fishing, alcohol brewing, weaving and selling mats and baskets, acting as "wholesalers" in the charcoal trade; and exchanging sex for money. Table 13 shows women's income-generating activities in selected pilot villages.

These relatively new income-generating activities have placed new burdens on women's time and energy, and have implications for their health and well-being. Women walk up to 12 kilometers everyday to collect fuelwood, spend more time in the collection and hauling of water, and spend hours stooped over in shallow waters fishing for prawns and small fish. Even more than simply expanding the time and strain of increased physical labor, however, particular activities can threaten women's health and safety directly. For example, in Ushongo, women have begun to sell fried fish in villages along the Tanga highway. They travel by bus and typically stay out for three weeks before returning for more fish—traveling farther and staying away longer than they ever used to. The difficulty of traveling by bus, the stress of being away from families, the increased burden on women's time and energy, and the threats to their health and security are tolerated, women say, for the small income that they can earn doing this kind of work.

In sum, understanding the tremendous gender inequality that currently exists in this coastal area is necessary to understand the root causes of risky sexual behavior, the HIV/ASIDS epidemic and poor health in general, and unsustainable resource use. Therefore, over the long term, redressing gender inequality is central to any mitigation strategy. Actions should aim to provide women with increased autonomy over and diversification of income-generation activities; improved access to health care and educational services regarding nutrition, HIV/AIDS and other STIs, and property and ownership rights; leadership development training and increased opportunities to participate in decision-making processes.

> Before my husband died [from AIDS], I was a housewife and my husband worked in the Sea Salt Company. When he became sick, we used his salary and our savings to pay for medical care. When he died, I invested the remaining funds in a fish frying business. I know other women who have opted to be fishers, firewood collectors, and charcoal and firewood salesmen. *(40-year old widow)*

IMPACTS OF HIV/AIDS ON BIODIVERSITY

Literature on the links between HIV/AIDS and natural resource management identifies three main direct impacts on natural resources and biodiversity (Drimie, 2002; Bishop-

Sambrook, 2004). These direct impacts are: 1) accelerated rate of extraction of natural resources due to increased dependence on wild foods and wildlife (especially fish in coastal communities), medicinal plants, timber, and fuelwood; 2) decreased availability of labor due to sickness and death; and 3) loss of traditional knowledge and skills.

ACCELERATED RATE OF EXTRACTION

Many of the impacts of HIV/AIDS on natural resources (reduced agricultural activity and productivity, intensive fishing in shallow waters, food insecurity) are observed in the pilot villages, but it is difficult to make a definite and direct link between HIV/AIDS and its impacts. We were able to interview only 7 households affected by the disease - because of the unwillingness of participants to volunteer information of a sensitive nature - and the nature of the project, which covered many complex issues (gender, resource use trends, livelihoods, population dynamics, HIV/AIDS) in many villages in a short period of time. Among the seven HIV/AIDS affected households, five mentioned that their farming activities have been negatively impacted — either because one or more family members is too sick to work — or because they have to divert time to care for someone who is sick. One person mentioned that sometimes it is not possible for him to go out fishing because he has to stay home and care for a sick family member — a positive trend in terms of decreased pressure on natural resources. Individuals that are sick maintained that as they were no longer able to farm, they had to engage in other forms of income generating activities that might bring in fast cash — such as casual labor.

> When my family member became ill, I continued fishing, but I also had to diversify to get additional income — I chose to hire people to make charcoal , which I sell in Zanzibar. (Scenario interview, Saadani).

Of the three direct impacts that HIV/AIDS can have on natural resources, an accelerating rate of resource extraction is the most easily observed impact in the Project area. People may look increasingly to natural resources as a source of income generation to replace other income lost—as a result of sickness or death of productive workers—due to HIV/AIDS, resulting in increased resource dependence and intensity of use (Africa Biodiversity Collaborative Group, 2002). For example, the use of small-mesh nets for both marine and freshwater fishing is common among households in the pilot village sites as they try to make a living from declining fish stocks. In the scenario interviews, people maintained that households that are affected by HIV/AIDS, have to diversify their activities to get more income, often putting more stress on the resource base. Household members have to cut more trees for charcoal and firewood. In both villages, it was indicated that some community members tend to engage in illegal activities, such as dynamite fishing and wildlife poaching — resulting in increased stress on the already depleted stocks. However, fishing is a physically demanding enterprise and it is possible that the pressure on fish and other marine resources may decrease if the number of HIV-infected fishermen increases.

People who have been affected by or afflicted with HIV/AIDS may develop a short-term outlook on both economic and environmental issues (Loevinsohn and Gillespie, 2003). This may mean a decline of effort in economic enterprises whose returns take longer to accrue, and less respect for conservation rules and sustainable practices in agriculture, fishing and other resource dependent activities where benefits are less visible, direct and immediate. The scenario interviews showed that people often opt for harvesting fuel wood and making charcoal — because it provides quick cash. It is not possible to say if

it is due to HIV/AIDS or poor productive conditions, but in several villages, such as Mikocheni, we found from the PRA exercise that there is a lack of interest in agriculture among the younger generation. Determining a causal relationship of HIV/AIDS on resource use practices in the project villages was difficult through the initial PRA activity since a detailed understanding of resource use rules and practices over time is needed. A much longer time period of study and detailed and quantitative community appraisals would be needed to understand with greater confidence the relationship between HIV/AIDS and environmental behavior in small rural coastal communities.

The growth of ecotourism offers some positive economic impacts in terms of alternative employment opportunities and markets for fresh fish and marine products. These benefits are being felt in Saadani and Ushongo villages. However, tourism creates negative impacts as well, such as increasing demand and price for shorefront property, movement of local people to alternative locations, and loss of beach access. Beach property sales and construction of new homes by outsiders were observed especially in Ushongo and Mkwaja. Tourism can also have a negative impact on biodiversity, for example leading to increased fishing effort as demand for fish from hotels and resorts increases.

DECREASED AVAILABILITY OF LABOR

The second direct (and negative) impact that HIV/AIDS can have on natural resources stems from an increase in mortality and illness and the consequent reduction in labor capacity. Because HIV/AIDS primarily affects adults between the ages of 25 and 45 years—the very people who work to support families and are usually the most productive economically—loss of adult labor and the capacity for heavy labor often leads to a suite of changes in affected households' use of land and water resources and agricultural practices (Haddad and Gillespie, 2001). Fishing is also a labor-intensive sector vulnerable to changes in fishers' capacity for long work hours. Sick fishermen may prefer fishing in shallow waters resulting in greater environmental deterioration and depletion of selected fish stocks since nearshore waters are important marine habitat (seagrass, corals, mangroves) and nurseries for juvenile fish (Bishop-Sambrook and Tanzarn, 2003). We were not able to detect greater nearshore fishing practice as a result of HIV/AIDS.

In the six villages where the primary economic activity is fishing, any loss of local labor is currently quickly and easily filled by high influxes of seasonal migrants during the prime fish harvesting months (March to June) and busy salt-making season (July-August). Therefore, although death and illness of fishers from AIDS could reduce effort, the open access nature of the fisheries — and the readily available labor pool— means that this will likely not occur. Also, for individual families, the loss of income from a male head-of-household puts additional burdens on his wife and children to find alternative sources of income, which can ultimately lead to more intense resource use and extraction.

> If a man is sick or has a sick family member, he will not be able to go camp fishing [staying away for stretches of time]. He will lose time at sea and he will not be able to perform his normal work duties. At the same time he will have to provide financial and material support to the sick — this is a very stressful situation (scenario interview Mkwaja village).

HIV/AIDS can also lead to loss of capacity within the conservation community — including many well-trained and experienced people (ABCG 2002). People working with conservation are often located in remote areas and may be away from their families for long stretches of time — just as with fishermen, this makes them especially vulnerable to engaging in activities that will lead to HIV/AIDS. When staff members pass away, organizations will loose institutional experience and memory. Loss of park rangers, extension officers, senior officials, and other conservation personnel, can have detrimental impacts. For example, if a park looses some of its rangers, villagers might become more inclined to poach or break other resource rules (because the risk of getting caught is lower). Also, when organizations loose personnel, they might have to divert some of their conservation funds to pay for death benefits, costs associated with caring for sick employees and with funerals, and loss of time on-the-job (ABCG 2002).

Discussing this issue with personnel working in the Pangani district, we found that 16 persons working with environmental management have died from AIDS during the last five years (Table 14). The Tanga Coastal Zone Conservation and Development Program has lost 3 persons in the last few years. One of the persons who passed away was a woman working to integrate gender issues into coastal conservation efforts and her expertise and enthusiasm has been hard to replace.

It is important that organizations establish procedures for coping with HIV/AIDS and the potential loss of personnel. One of the hotels we interviewed mentioned that they require their personnel to take HIV tests every month. This could be good or bad depending on how the tests are preformed (e.g. are the anonymous or not?) and how the results are dealt with (e.g. are infected personnel fired or do they get treatment and support?). The Wildlife and Environmental Society of Malawi has been a leader in the region, mainstreaming HIV/AIDS into the organization in 2003. Tanzania National Parks (TANAPA) have recently adopted a similar work-place policy on HIV/AIDS with a five-year implementation plan that includes elements of awareness raising, HIV transmission prevention, HIV/AIDS testing, care and treatment, work-place safety, and social support services.

Table 14. Loss of management capacity in the Pangani District

Job type	Female	Male	Total
Councilor	1	1	**2**
Ward Executive Officer	1	0	**1**
Village Executive Officers	0	1	**1**
Member of Environment Committee	3	3	**6**
District Council officers,	2	1	**3**
Total	**7**	**6**	**16**

LOSS OF TRADITIONAL KNOWLEDGE AND SKILLS

Evidence of the loss of traditional knowledge and skill, a third direct impact that HIV/AIDS can have on natural resources, is difficult to discern with any certainty in these eight villages. Increasing numbers of orphans and women-headed households, however, suggest that knowledge and skills traditionally passed from a father to his children may indeed be lost to some degree.

When children have not acquired the skills to perform key agricultural, fishing, or other economic activities, livelihood insecurity increases (Loevinsohn and Gillespie, 2003). Significantly, loss in knowledge of sustainable land and resource management practices, which are traditionally passed on between generations, can cause natural resources degradation and a decline in productivity. For example, as men in their prime working years succumb to HIV/AIDS, more unskilled youth take on fishing responsibilities before they would otherwise do so. Youth generally have less respect for, or knowledge about, the unwritten laws that have enabled fishers to secure their livelihoods for generations (Bishop-Sambrook and Tanzarn, 2003). We could not empirically verify any of these impacts in the project villages through the PRA exercise. More detailed follow-up appraisals are needed to understand this potential impact of HIV/AIDS on fishing practices.

HIV/AIDS mainstreaming in the Wildlife and Environmental Society of Malawi (WESM)

After loosing 7 of their staff to AIDS, the WESM, decided to establish a set of measures to mainstream HIV/AIDS into the organization, including:

- Establishment of social welfare committees to collect funds for funerals and condoling bereaved staff members.
- Talking about HIV/AIDS openly during meetings to break stigma and show the seriousness of the matter.
- Send selected staff members to a training of trainer course to raise awareness about HIV/AIDS.
- Designate a staff member to become a desk officer for HIV/AIDS issues.
- Allocate budget to enhance the fight against HIV/AIDS through publications, meetings, awareness materials, and rallies.
- Increase internal education by providing a HIV/AIDS orientation training for most of the staff and their spouses and establishing a HIV/AIDS resource center with information and condoms.

Based on observations and findings from the PRA analysis on livelihoods and resource use, patterns of mobility, and social behavior of community members, it is very likely that HIV/AIDS is contributing to food insecurity, gender inequality, social disruption, and natural resource degradation throughout the project area. Since six of the pilot villages are dominated by artisanal fishing and experience a high degree of mobility among fishers, these communities are particularly vulnerable to HIV infection. The links between poverty, mobility, and HIV/AIDS suggest the need for solutions focused on livelihood strategies that offer survival mechanisms in an increasingly difficult economic context — and for prevention, control, and treatment programs tailored to vulnerable populations.

IMPACTS OF SAADANI NATIONAL PARK ON LIVELIHOODS

While HIV/AIDS impacts livelihoods and the natural environment, natural resource conservation also has impacts on livelihoods, both positive and negative. Negative economic impacts exacerbate the conditions of persistent poverty thereby contributing to a downward spiral of poverty, HIV/AIDS, and natural resource degradation.

Negative economic impacts of natural resource conservation on the adjacent communities are primarily associated with access to SANAPA land and the presence of wildlife. Several of the villages noted problems in obtaining poles and fuelwood since Mkwaja Ranch was appropriated by SANAPA. Other villages noted the burden that closed access to Madete beach in SANAPA boundaries would place on travel to neighboring villages. For example, it would create an 18 km walk to reach neighboring Mkwaja village for the residents of Buyuni. People are still crossing Madete beach, but if this closure is strictly enforced it would make life more difficult. The beach closure — and the closed marine area would also limit the access for fishermen to launch their boats and fish in the surrounding waters.

The boundaries of SANAPA generally exclude settlement areas, and as a result, seven of the project villages are just outside the Park boundaries: Matipwili, Saadani, Buyuni, Mkalamo, Mkwaja, Mikocheni, and Sange. Saadani and Buyuni villages are completely surrounded by the Park. These villages are exposed to marauding wild animals such as baboons, vervet monkeys, warthogs, elephants, and lions. Wild animals make it more difficult to collect water and fuelwood from sources outside the village and destroy crops and trees. In villages that are already poorly nourished, the loss of available land due to SANAPA and the loss of crops or inability to farm because of animals add another dimension of vulnerability. Insecurity as a result of loss of crops from wild animals results in reduced production and unwillingness to invest further in agriculture.
Furthermore, drought conditions over the past four years and a general deviation in the normal rainfall patterns have caused at least three villages—Saadani, Mkalamo, and Mkwaja—to experience severe food shortages for several years.

Through its effects on reducing available household labor, HIV/AIDS both causes and exacerbates vulnerability to episodes of acute food insecurity, as well as chronic food insecurity (Loevinsohn and Gillespie, 2003). Shocks that used to be weathered may become more significant in the context of AIDS. Furthermore, during times of food insecurity, such as during drought, individuals can be forced to engage in survival strategies that increase their vulnerability to contracting HIV (Drimie, 2002). Interviews with women in the Project area demonstrate this reality. Women in at least five of the eight villages have admitted with concern that increasing numbers of women are being forced to barter sex for money and food, thereby exposing themselves to the risk of HIV infection, as well as to unwanted pregnancy, gender-based violence, and stigmatization.

CONCLUSIONS

This report documents the immense challenges to peoples' livelihood in the eight villages within the project site even without the additional problems caused by HIV/AIDS. These challenges include drought, poor soil conditions, lack of productivity increasing agricultural inputs such as irrigation and machinery, declining fish catch, lack of improved fishing boats, gear and marketing channels, crop losses from wildlife, poor physical infrastructure, as well as lack of transport, credit, and communications. The villages are characterized by factors that make them susceptible and vulnerable to the impacts of HIV/AIDS: widespread poverty, significant seasonal migration and movement of people, food insecurity, gender inequalities, and poor health services.

Drawing from the literature and our assessment of the villages, we have found that key factors that shape the impact of HIV/AIDS on the natural environment include gender and power relations, livelihood practices and poverty. Reducing gender inequalities and

poverty, and improving livelihoods are therefore integral to mitigating the impacts of HIV/AIDS on unsustainable resource use. Poverty effects individuals' and communities' vulnerability to the spread of HIV, their ability to handle risks, and opportunities to participate in prevention and care activities. Figure 11 illustrates the relationship between HIV/AIDS, poverty, biodiversity, resource use and food security.

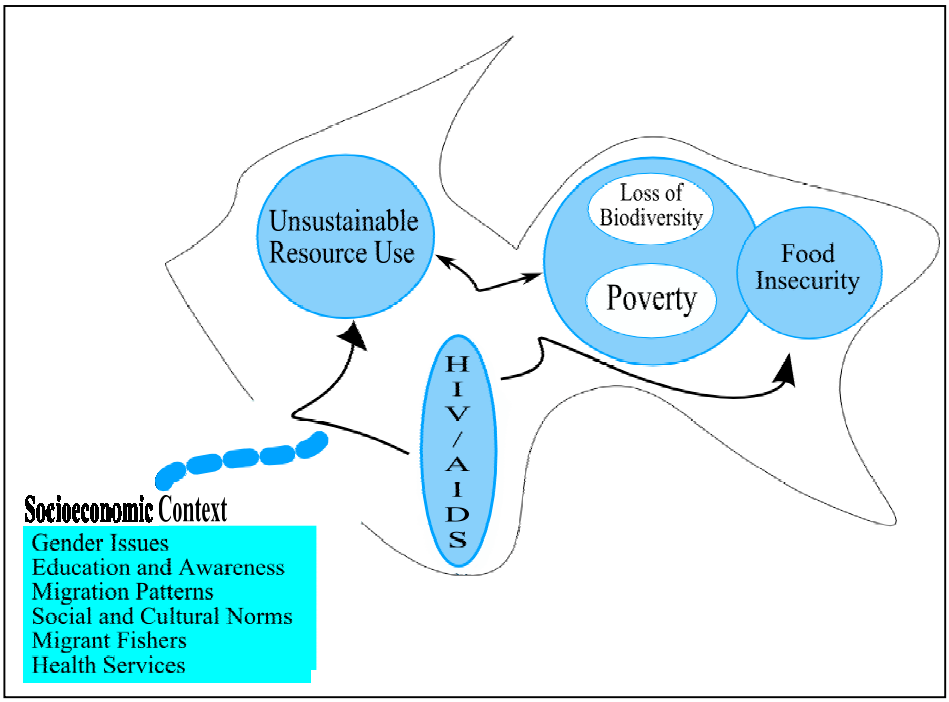

Figure 121. Linkages of HIV/AIDS to biodiversity, resource use and poverty

The PRA exercise showed that it is difficult to obtain direct information on HIV/AIDS and to disentangle the possible impacts of HIV/AIDS on local resource use and biodiversity conservation from other factors driving livelihood practices. Nevertheless, we draw a number of conclusions:

1) There is a trend towards increased destructive practices — especially woodcutting and charcoal making — among HIV affected households. It is possible that if the HIV/AIDS infection rate rises significantly, the coastal population could decrease to a level where the pressure on natural resources goes down. However, the evidence of in-migration suggests that the population pressure will actually increase. Therefore we expect the need to deal with increased pressure, especially on resources that can bring in quick cash (e.g. dynamite fishing and poaching). Livelihood options are limited in the villages and HIV/AIDS affected households in particular, need to find less labor-intensive alternatives. Suitable types of livelihoods need to be further explored (e.g. learning from an effort led by the Population and Community Development Association in Thailand) and they could include improved seaweed technologies, converting salt ponds to milkfish farms, bee keeping, and community-based tourism.

2) HIV/AIDS has led to loss of staff within organizations that work with biodiversity conservation (park staff, district officers, etc.). This contributes to loss in management capacity and institutional memory. It is also a double edged sword, because if villagers

become more desperate in their use of natural resources, increasing the tendency to break management rules, at the same time as the conservation areas loose management staff, it will become more difficult to enforce conservation rules. Hence, it is essential that conservation groups develop and implement work place policies for HIV/AIDS that includes plans for how to deal with loss of capacity. For example, it should include how to manage knowledge generated within the conservation effort in a way that it will not be lost if a person dies of AIDS.

3) Women between 30-40 years of age seem to be the most vulnerable in terms of HIV/AIDS infection rate (figure 9). Women are also the ones who are responsible for taking care of those who are sick. Whether sick or having to take care of sick family members, women loose precious time and resources due to HIV/AIDS. Hence, it they should be a target group for efforts to relieve the burdens that HIV/AIDS bring about. This could include developing fuel-efficient stoves — helping the women and reducing the pressure on forest resources.

4) The Saadani Park has caused some dissent among the surrounding communities. Villagers feel that they were not adequately involved in establishing the park and many perceive that the park has made their life more difficult. Although the Management Zone Plan indicates that the Plan was prepared through a participatory approach with major stakeholders and that a stakeholder meeting was held in Bagamoyo, it does not yet appear that significant number of residents in the villages surrounding the park have been meaningfully consulted in development of the Plan. As the PRA exercise discovered, most of the pilot villages border the Saadani National Park and are experiencing food shortages in part due to agricultural destruction by wild animals. The villages are also extremely dependent on natural resources for their quality of life, and the Park reduces total available area for resource extraction. The land cover data demonstrates that the land outside the park is suffering — being transformed from grassland to bare soil. If the 66 km^2 of marine zone becomes implemented and enforced as a no-fishing zone — limiting access to fisheries - this might cause even further conflicts with the neighboring villages. However, permanent closed areas have demonstrated positive long-term benefits for fisheries. Therefore, it is essential that the villagers are involved in the development of a comprehensive General Management Plan, ensuring that they feel that they have something to gain from complying with park rules and zoning plans. This could include developing a participatory community conservation and education program.

5) Mechanisms to share the benefits of the National Park with the poor and burdened buffer communities would, in the long run, help reduce poverty and the nexus between poverty, unsustainable resource use, and HIV/AIDS. Benefit sharing actions might include provision of food, compensation through direct payments, job training and creation of alternative livelihood options (e.g. Park caretakers, ecotourism services). Actions should be designed in a way that maximizes the empowerment of women and food security of households. They should also be suitable (e.g. less labor intensive) for families where one or more family members are suffering from HIV/AIDS. It would also be useful to explore benefit sharing and assistance mechanisms with buffer communities in other Parks in Tanzania.

6) Even though population pressures are lower in the Pwani and Tanga regions compared to the national average, some of the coastal villages (Sange, Ushongo, and Saadani) have a higher population growth than the national average. These villages

are also seeing substantial seasonal migration during the shrimp and tuna seasons. Seasonal migrants are vulnerable groups, especially as they might be more likely to engage in risky sexual behavior and contribute to the spreading of HIV/AIDS. It is important to target migrant fishers and salt workers for HIV/AIDS prevention programs and educate the newcomers (whether permanent or temporary) in wise resource use practices, the dangers of engaging in risky sexual activities — and the linkages between health and the environment. It is equally important that the villages consider these linkages as they develop and implement HIV/AIDS and environmental management plans. The villages will likely need help in developing environmental and HIV/AIDS plans — including training and other communication programs in the pilot villages that provides information on the crosscutting linkages.

7) There is also a need to incorporate HIV/AIDS related issues in the ICM District Action Plans of Bagamoyo and Pangani and the Collaborative Management Area plans in Tanga. Currently, these resource management plans do not address HIV/AIDS and related issues. Assisting the district in revising the plans could include training on the linkages of biodiversity conservation, HIV/AIDS, and livelihoods — especially as they relate to gender.

THE WAY FORWARD

From the threats assessment, we can conclude there is much to do to address the major impacts of HIV/AIDS on biodiversity conservation (accelerated rate of extraction, decreased availability of labor, and loss of traditional knowledge and skills) at village and pilot-area-wide level. Potential actions that are in the nexus between biodiversity conservation, health, population, and gender are:

Improve resource management

- Develop organizational policies and procedures among conservation and natural resources management organizations and projects for dealing with loss of capacity due to HIV/AIDS
- Ensure that surrounding villages are involved in developing a General Management Plan for the Saadani Park, including the development of an MOU between the Park and the villages — and a community conservation involvement program.
- Plan and implement with community groups activities that decrease pressure on coastal resources, targeting families - especially women - that are affected by HIV/AIDS (e.g. piloting energy efficient stoves and more energy efficient charcoal making technologies)
- Mainstream health aspects into collaborative fisheries management plans.

Develop sustainable natural resource-based livelihoods — especially those that are less labor intensive and can be targeted at people who are directly or indirectly affected by AIDS (e.g. women).

- Promote and develop agroforestry, honey production and seaweed farming enterprises in selected communities through extension initiatives.
- Demonstrate and promote adoption of new food production enterprises in mariculture (e.g. extensive and low impact milkfish culture) and backyard/alternative/organic agriculture
- Develop and market value added fisheries products to increase economic returns to fishers

- Promote and develop ecotourism enterprises (information center, training of local people in safe boating practices, history and culture, hotel services, reef ecology, training in handicrafts)
- Provide capital for micro-credit and revolving funds for enterprise expansion and development

Communication, advocacy, awareness and education on HIV/AIDS and linkages to environment at the district and village levels

- Develop communications strategies (convey messages through Kangas, theatre, dance, brochures, t-shirts, caps, billboards and art work, radio, documentary film on PHE linkages, etc.)
- Implement outreach/communications strategies including outreach programs in local primary and middle schools
- Train and provide material support for local, participatory theatre and dance

Prevention, care and support of HIV/AIDS affected families

- Establish and strengthen VCT centers
- Establish OVC (orphans and vulnerable children) programs
- Strengthen HBC (home based care) programs and service providers
- Organize and train fishers to deliver HIV/AIDS messages (such as in Zanzibar)

Mainstream HIVAIDS into local institutions and organizations

- Establish, train and strengthen village, ward and district HIV/AIDS Committees
- Mainstream PHE into SANAPA (Saadani National Park) management plan
- Mainstream HIV/AIDS into Village and District Plans
- Build capacity and networks of local NGOs that provide HIV/AIDS prevention, care and treatment services

HIV/AIDS control is a very complex task and requires many players to come up with a comprehensive response in the various areas of prevention, care and support for people affected by HIV/AIDS, and impact mitigation. With limited resources, the PEACE project can not hope to make a significant impact on the challenges to peoples' livelihood in the eight project demonstration villages, or to significantly change the HIV/AIDS situation in the eight villages. Therefore, it will be important to identify small, targeted early actions that provide short-term material benefits and serve as concrete examples. It is equally important to work towards longer-term benefits for the villages and the two districts by working through existing institutional structures and strategies, as well as by complementing ongoing sectoral and integrated efforts.

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