



Putting Adaptive Management into Practice: Collaborative Coastal Management in Tanga, Northern Tanzania

Edited by:

Sue Wells, Solomon Makoloweka and Melita Samoilys



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2007

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This publication has been made possible by funding from Irish Aid (IA).

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Citation: Sue Wells, Solomon Makoloweka and Melita Samoilys (2007): **Putting Adaptive Management into Practice: Collaborative Coastal Management in Tanga, Northern Tanzania**, x+ 197p.

Photo credits: M. Dengo, M. Mayer, M. Podalan, M. Samoilys, E. Verheij, S. Wells and Tanga Coastal Zone Conservation and Development Programme

Design & Layout by: Gordon Arara

Available from:

IUCN EARO Publications Service Unit
P. O. Box 68200 - 00200, Nairobi, Kenya
Tel: + 254 20 890605-12
Fax: +254 20 890615
E-mail: earo@iucn.org
www.iucn.org/places/earo

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ACKNOWLEDGEMENTS

Many people have contributed over the years to the TCZCDP, and without their commitment and strenuous efforts, this publication would not have been possible. Grateful thanks are extended to the following in particular:

Programme Advisers

Solomon Makoloweka	Regional Coastal Management Facilitator, Programme Coordinator
John Kabamba	Forestry & Mangroves, Muheza
Hassan Kalombo	Fisheries & Coral Reefs, Muheza
Claudia Kawau*	Training, Awareness & Education, Muheza (deceased 2003)
Zuberi Lugazo	Mariculture, Muheza
Frida Urio	Agriculture, Pangani
George Uronu	Community Development & Participation, Tanga
Enedy Mzava	Environmental Education, Tanga
Lucian Massawe*	Forestry and Mangroves, Tanga 1994 - 1997 (deceased 2005)
Mwandaro Mussim*	Material Production Officer(Graphics), 1995-1996, Tanga (deceased 1997)

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Lawrence Kuziwa	District Coordinator, Muheza (1995 - present)
Leonard Challenge*	Community Development Officer, 1995 - 1998. (deceased 1998)

Tanga Municipality/City Officers

Mussa Dengo	DNRO & District Coordinator, Tanga Municipality/City (1995 - present)
-------------	---

And all other cooperating District officers and extension workers.

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Awareness, Education & Training, 1994-1997; CTA, 1997-2001

Eric Verheij

Technical Adviser, 2001-2004

IUCN-EARO Marine Programme Coordinators

Rod Salm

1994 - 1999

Sue Wells

1999 - 2003

Melita Samoily

2003 - 2007

And other IUCN staff members who have contributed over the years including Abdulrahman Issa, Mine Pabari, Dalmas Oyugi, Charles Jowi, Florence Njiriri and Gordon Arara.

Participants at the Book's preparatory workshop:

Mohamed Abdallah

District Enforcement Officer, Muheza

Jim Anderson

Fisheries Consultant

Joyce Bwindiki

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Col. A.H. Khatib

URT Navy, Dar es Salaam

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Mangrove Management Project, Muheza (Moa)

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Abdallah H. Muhunzi

Kigombe Village facilitator

William Nganda (SSP)

Marine Police Commander, Tanga

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*With deep regret we acknowledge the passing away of five TCZCDP colleagues during the course of the Programme; their invaluable contributions are greatly appreciated and sorely missed.

Sincere thanks are also extended to all the former and present RASs, DEDs, consultants, evaluators, and cooperating projects and institutions who have contributed to the achievements of the Programme, notably Irish Aid, the District and Village Councils, the TCCF, the PSC, the Navy, Marine Police, the MMP, TCMP, IMS, SEMMA/SEEGAAD, University of Dar es Salaam, and CORDIO-EA and those who provided comments on earlier drafts or other inputs including Catharine Muir, Sibylle Riedmiller and Eric Allard.

Finally, the TCZCDP would not have been implemented without the generous long term support of Irish Aid. The substantial commitment of funds from Irish Aid over 12 years was unquestionably a major factor in the achievements of the Programme. Such long term funding in the environmental sector is unusual and illustrates the foresight and commitment of the Irish government to Tanzania's coastal and marine resources and the people that depend on them. All those involved and committed to the TCZCDP greatly appreciate this generous support from Irish Aid.

ACRONYMS

BMU	Beach Management Unit
CBD	Convention on Biological Diversity
CCC	Central Co-ordinating Committee
CCM	Chama Cha Mapinduzi
CDF	Community Development Fund
CEAS	Coastal Environmental Award Scheme
CMA	Collaborative Management Area
CMAP	Collaborative Management Area Plan
CMT	Council Management Team
CORDIO	Coastal Oceans Research & Development Indian Ocean
CPUE	Catch per Unit of Effort
CRC	Coastal Resources Center, University Rhode Island
CRCP	Coral Reef Conservation Project
CTA	Chief Technical Adviser
DC	District Co-ordinator
DED	District Executive Director
DMT	District Management Team
DNRO	District Natural Resource Officer
DO	District Officer
DoFi	Division of Fisheries
DTF	District Task Force
DTT	District Technical Team
EARO	IUCN Eastern African Regional Office
EIA	Environmental Impact Assessment
FAD	Fish aggregating device
FMC biopolymers	Food manufacturing corporation
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German technical cooperation)
KWS	Kenya Wildlife Service
IBA	Important Bird Area
ICM	Integrated Coastal Management
ILO	International Labour Organisation
IMS	Institute of Marine Science
IUCN	The World Conservation Union
KICAMP	Kinondoni Integrated Coastal Area Management Programme
LGRP	Local Government Reform Programme

MMP	Mangrove Management Project
MNRT	Ministry of Natural Resources and Tourism
MOU	Memorandum of Understanding
MPRU	Marine Parks and Reserves Unit
NEMC	National Environment Management Council
NGO	Non-governmental organisation
NORAD	Norwegian Agency for Development
O&ODP	Opportunity and Obstacle Development Planning
PORALG	President's Office of Regional Administration and Local Government
PRA	Participatory Resource Analysis
RAS	Regional Administrative Secretary
RCRC	Regional Coastal Resource Centre
RFA	Regional Fisheries Adviser
RFIS/SADC	Regional Fisheries Information Systems/Southern Africa Development Community
RIPS	Rural Integrated Project Support (RIPS) programme (FINNIDA)
SEEGAAD	Smallholder Empowerment and Economic Growth through Agribusiness & Association Development
SEMMA	Sustainable Environmental Management through Mariculture Activities
SEMP	Socio-economic Monitorign Programme
TA	Technical Adviser
TANAPA	Tanzania National Parks Authority
TASAF	Tanzania Social Action Fund
TCCF	Tanga Coastal Consultative Forum
TCMP	Tanzania Coastal Management Partnership
TCZCDP	Tanga Coastal Zone Conservation and Development Programme
TDFMN	Tanga Dynamite Fishing Monitoring Network
TOR	Terms of Reference
UDSM	University of Dar es Salaam
VEMC	Village Environment Management Committee
VMT	Village Monitoring Team
WIOMSA	Western Indian Ocean Marine Science Association
WWF	World Wide Fund for Nature
Zascol	Zanzibar agro Seaweed Company limited

CHAPTER 1: INTRODUCTION

The three most northern coastal Districts of Tanzania (Muheza, Pangani and Tanga City), three very different places but united by common threads of history and a common need for economic development, have been working together with the Tanga Regional Administration for the past 12 years to find a way to manage the coastal resources on which they depend. This book describes these efforts, giving the history and achievements of the Tanga Coastal Zone Conservation and Development Programme (TCZCDP). It documents the lessons that have been learnt over more than a decade with particular emphasis on the way in which the approach of “adaptive management”¹ has been used.

By the early 1990s, unsustainable use of coastal resources was an increasing problem, as evidenced by declining yields of fish and thus income, deteriorating conditions of the coral reefs, and continuing reduction of the area of mangroves and coastal forests. In 1987 the Tanga Regional Administration first requested technical assistance from IUCN's Eastern African Regional Office (IUCN-EARO) to address these problems. Financial support was obtained from Irish Aid, and the TCZCDP started in 1994 with technical support from IUCN-EARO. It was initially implemented through the Regional Administration, and as the Local Government Reform Programme (LGRP) began to take effect in the late 1990s, responsibility for natural resource management was progressively shifted to the three individual Districts and the local communities.



The main aims of the TCZCDP have been to improve the 'ecological integrity' of the coastal zone, whilst ensuring that its natural resources continue to provide for sustainable development of the coastal population, recognising that the economy and prospects for raising the standard of living in coastal villages was almost solely dependent on the natural resource base. The more specific objectives have been to:

- Put in place collaborative management plans for coastal resource use, with a particular emphasis on fisheries and mangroves
- Improve the ability of all stakeholders to protect, manage and monitor their coastal resources and in particular build the capacity of local communities for coastal management
- Raise awareness of the importance of the coastal zone and its resources.

The activities of the TCZCDP have been documented through a range of publications produced during the course of the Programme, including overview papers such as Makoloweka and Shurcliff (1997) and Verheij *et al.*, (2004), as well as reports on specific topics such as mangrove management (Nurse and Kabamba, 2000), collaborative fishery management (Horrill *et al.*, 2001), gender (Ingen *et al.*, 2002), fisheries analysis (Anderson, 2004), monitoring

¹ In this context 'adaptive management' means improving management by evaluating actions taken and analysing whether changes are needed for greater success in the future

and assessment (Pabari *et al.*, 2005), and fisheries management (Wells *et al.*, 2006). In 2000, a 3-day workshop to distil lessons learnt from one key aspect of the TCZCDP village 'Action Planning', was held in Tanga, facilitated by the Coastal Resources Center (CRC) of the University of Rhode Island and attended by government staff, villagers, and representatives from TCMP, Mafia Marine Park, the Marine Parks and Reserve Unit (MPRU) and IUCN-EARO (Torrell *et al.*, 2000), the results of which are incorporated into this book.

By Phase III, it was felt that a publication covering the TCZCDP more broadly would be of value, particularly since other Districts in Tanzania were starting to consider how best to manage their coastal resources and were looking to the TCZCDP as a potential model. A 'Book workshop' was therefore held in January 2004 to bring together all the key TCZCDP staff, including those now working for other organisations in the Region, previous IUCN Technical Advisers, and many government officers and village representatives. The workshop reviewed all phases of the TCZCDP to identify achievements, challenges and key lessons learnt. Individuals were identified to take the lead in compiling information for each chapter of the book. Over the subsequent three years, the book was compiled using both the information collated at the workshop and the vast repository of Programme documentation accumulated since 1994 such as annual and end-of-phase reports, reports of the mid-term and final evaluations for each phase, consultancy reports, and published papers.

The purpose of this publication is thus to:

- Provide a reference guide on collaborative management area planning for other Districts and Regions in Tanzania
- Outline the history and evolution of the methods and approaches adopted by the TCZCDP for the benefit of new leaders and personnel at all levels of society within Tanga Region
- Share the TCZCDP's wealth of experience with others, both nationally and internationally
- Motivate the local communities, local government personnel and other stakeholders who have participated in the TCZCDP to continue their remarkable efforts
- Encourage donors, international NGOs, and national and international academic and technical institutions to support and assist the Districts and Tanga Region in their coastal management work.

Tanzania is one of the poorest nations in the world. In 2004, it ranked 162 in the list of 177 countries on UNDP's Human Development Index, and in 2006 had a GDP per capita of US\$336 (IMF World Economic Outlook Database, September 2006), lower than many other countries in Sub-Saharan Africa. At the same time, it has been at the forefront of coastal management approaches and developments on the African continent. Notably through the Tanzania Coastal Management Partnership (TCMP), Tanzania was the second country in Africa to develop a national coastal management strategy, in 2003; Tanzania also provided early regional leadership in ICZM culminating in *The Arusha Resolution on Integrated Coastal Zone Management in Eastern Africa including island States* of 1993 (Voabil and Engdahl, 2001), and it has hosted some pioneering coastal and marine biodiversity conservation programmes through other international organisations such as the World Wide Fund for Nature. The 2005 publication *Blueprint 2050* sets out the national vision for protection and sustainable management of Tanzania's seas and coasts over the next 50 years (Ruitenbeek *et al.*, 2005). The innovative work undertaken in the three Districts of Tanga Region has already contributed to, and will in the future continue play a key role in, the fulfillment of this vision.

CHAPTER 2: TANGA REGION GENERAL DESCRIPTION

Solomon Makoloweka and Sue Wells

2.1 Introduction

Tanga Region, the northernmost part of the coast of mainland Tanzania bordering Kenya, covers a total area of 26,808km² (Figure 2.1). Until 2006, when Muheza District was divided into two, it had seven Districts, three of which are coastal (Pangani and Mkinga (previously Muheza² and referred to as such through this book) Districts and Tanga City³). The coastline, in a straight line, is about 180km long from the Kenyan border in the north to the border with Coast Region in the south, or over 400km if bays and estuaries are included (Table 1.1). The coastal plain extends inwards for 20-30km and in the north-west is bordered by the Usambara Mountains which rise to over 2000m (Tanga Region, 1985).

The continental shelf off Tanga Region is about 2,090km² in area, varying in width from 5-10km between Tanga and Pangani, to over 40km near the Kenya border and south of Pangani (Bensted-Smith, 1988). The inshore waters are characterised by fringing and patch coral reefs, sea grass beds, mangrove forests, and several estuaries and embayments. The largest river in Tanga Region (and one of the largest in Tanzania) is the Pangani, which flows south-east through the Usambaras from Kilimanjaro, and reaches the Indian Ocean at Pangani Town, providing a link between the coast and the highest mountain in Africa.

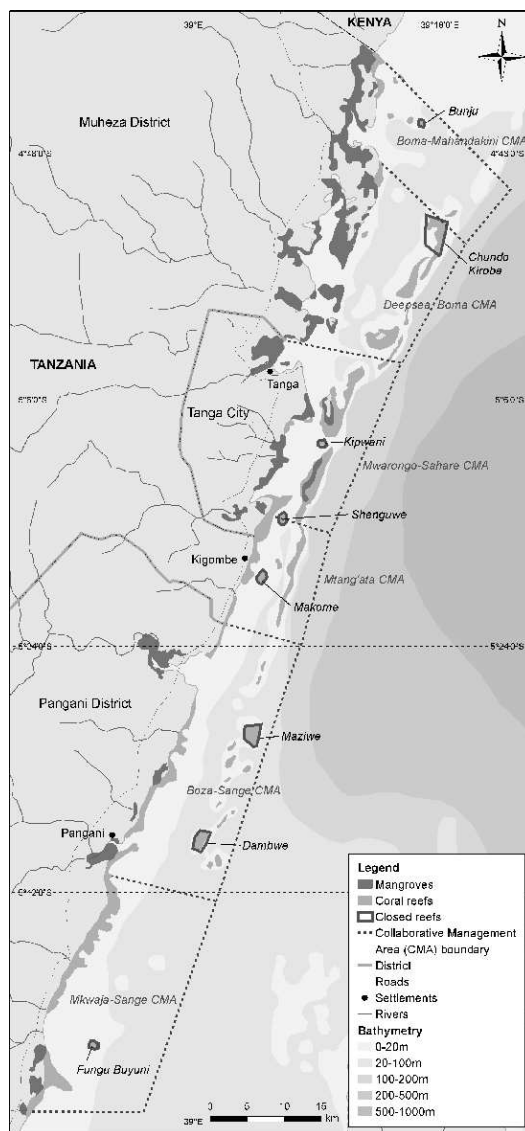


Figure 2.1: Map of Tanga Region, northern Tanzania, showing collaborative management areas.

² Muheza was split into two Districts in 2006: Mkinga District is the coastal area to the north of Tanga. The coastal part of Muheza south of Tanga is to become part of Pangani new Muheza will have no coastal area

³ Throughout the period of the TCZCDP, Tanga City was known as Tanga Municipality; the name and status was changed in 2005.

The population is scattered along the coast in 49 main villages⁴, and two principal towns, the main one Tanga and a small one, Pangani (Table 2.1). According to national census data from 1994, the coastal population comprised approximately 379,000 (c. 150,000 people in villages, 223,000 in Tanga Municipality and c. 6,000 in Pangani Town). By 2005, the coastal population was over 500,000 (242,640 Tanga City, 6000 Pangani Town, and nearly 220,000 in the villages of the coastal wards) (Table 2.1).

Table 2.1. Geographical and demographic characteristics of the three Districts

District	Area km ² #	Coastline km**	Reef edge km**	Population total District*	Population coastal wards*	No. of coastal wards*	No. of coastal villages*
Muheza	4,922	190.5	287.5	279,423	26,541	5	21
Tanga	536	84.0	165.5	242,640	177,799	17	17
Pangani	1,425	132.5	218.0	43,920	15,075	6	11
Total		407.0		565,983	219,405	28	49

District Socio-economic Profile reports, 2004

*National Census Report (GOT, 2003)

** Horrill (1999); length includes bays and mangroves

2.2. History and traditional knowledge

The coastal communities of Tanga Region are a mixture of ethnic groups and cultures (African, Arab and Asian) and are predominantly Muslim. The dominant tribes were originally Digo, Bondei, Zigua and Segeju, but the distinctions have largely been blurred through the high degree of social mixing with other ethnic groups and between communities. There is much contact between coastal villages and genetic exchange through marriages and re-marriages. Historically villages had much local knowledge of natural resources, and older fishers still retain this, but there is little evidence of any traditional management systems. This is thought to be because human populations were low and resources were abundant, so there was no specific need for management. But there is a traditional form of conflict management known as *Kusuluhisha* village elders and other older people are invited to mediate local disagreements at meetings or *barazas* (Scheinman and Mabrook, 1996).



⁴Villages often comprise a number of sub-villages or hamlets, and published figures vary. The total of 49 refers to those villages that qualify under the 1967 Village Act.

According to Scheinman and Mabrook (1996), the hilly coastal strip, extending from the Shimoni area of Kenya in the north, south to Tanzania in the south, was traditionally known as the *Mrima* and was inhabited by a thriving coastal society up until the 18th century. The population remained relatively undisturbed until the Omani Arabs established control over Zanzibar and the coast in the early 1880s. This resulted in much social upheaval and turmoil and led to the establishment of the first coconut plantations in Tanga Region. In the 1880s, the Germans assumed control over Tanzania (then Tanganyika) and initiated a western style of development in the region, establishing schools and European-style buildings, and initiating the sisal industry. Following the First World War, from 1919, until independence in 1961, the Region was administered by Britain, during which period, as previously, the villages generally continued to manage their own affairs through their traditional leaders.

Local village powers were eroded after independence, with the central government exerting increasing influence. The authority and political power of the village elders progressively declined and was replaced by village chairs, secretaries and council members who had to be approved by the single political party Tanganyika African National Union (TANU) which in 1997 became *Chama Cha Mapinduzi* (CCM) and who represented the executive authority of central government. Multi-party politics started in 1993, and since then village governments have had increasing freedom to make their own decisions and policies and to deal with local issues. The elders still have very little real power but continue to be consulted to adjudicate village disputes. By the beginning of the TCZCDP, villages were no longer run by party officials, making it an appropriate moment to introduce activities that would help to empower communities and develop community participation in decision-making.

2.3. Economy of Tanga Region

In the 1960s, Tanga was one of the most economically important Regions of the country on account of the sisal industry and the deepwater port. Starting in the 1880s, the sisal industry progressively took over large areas of land. Initially, this caused little displacement of the population, which was small and concentrated in compact communities separated by large blocks of unoccupied land, although problems developed later as the local population grew and lacked land for farming (Scheinman and Mabrook, 1996). The decline of the sisal trade in the 1970s/80s due to the replacement of sisal with synthetic materials, and the nationalisation of the industry, were of critical economic importance. This coincided with a more general crisis period nationally, characterised by droughts, the break-up of the East African Community and war with Uganda in the 1970s. Global events at the same time, such as the oil crisis, led to a depression in export prices. Incomes declined, living standards were lowered, and informal sector activities became a major form of income generation. By the late 1980s, the Region was at a low ebb economically.

Since the mid-1990s however, and thus over the period of the TCZCDP, there has been progressive recovery. In 2004, sisal prices were back to those of the 1960s (US\$900/kg, compared with US\$1000/kg in the late 1960s according to the owner of the Mkongwe Hotel in Tanga City). The airport that had been closed for many years re-opened and there are regular scheduled flights to and from Zanzibar (Pemba) and Dar es Salaam, although the ferry to Pemba



in Zanzibar has ceased. Infrastructure is rapidly improving, as well as roads and communications, and the port is expanding. Water for Tanga comes from the Mbayani reservoir on the Sigi River, although the main sources for coastal villages are still boreholes and shallow wells. Hale Power Station on the Pangani R. is an important source of electricity for the national grid. Tourism is starting to develop, and the Region has been identified as a priority for coastal tourism development in the National Tourism Development Plan.

2.4. The Districts

2.4.1. Muheza (Mkinga) District

Throughout most of the TCZCDP, Muheza was the largest of the three Districts, bordering Kenya in the north and including the Usambara Mountains towards the west. The District headquarters are located in the town of Muheza which is 32km inland. The coastline is heavily indented with creeks, small rivers flowing from the Usambaras to the sea, and there is extensive mangrove forest. The main river is the Sigi which flows into the sea just north of Tanga. At present, there is little coastal tourism in this District, but the fishery is important, although most economic activity is oriented around the inland areas and the Usambara Mountains. The coastal road is an important through-route to Kenya, and the coastal villages tend to be along the road rather than on the shore. With the planned upgrading of the unpaved road from the border to Tanga City, there is expected to be rapid development in a range of economic sectors in what is now one of Tanzania's newest Districts.

2.4.2. Pangani District

This District is comparatively sparsely populated and less well developed than the other two. It has a flat coastal plain rising inland to undulating slopes important for sisal. The unpaved road, which is often impassable in the rainy season, leads to the District centre at Pangani Town (an important historical town), and then south to Saadani National Park. The District is divided by

the Pangani River, which has a deep, fast flowing mouth at Pangani Town and no bridge. The southern part is thus relatively inaccessible other than via the ferry and, apart from sisal farms, has vast areas of woodland and bushes extending south to Saadani National Park. The Msangazi River, south of Pangani River, is the second main river and there are also a number of streams. The coastline is relatively straight, with few villages, shallow waters offshore and relatively few coral reefs (Figure 2.1). However, it has the best sandy beaches in the region and for this reason, a more developed tourism industry, with nine hotels. This District is slated for coastal tourism development in the National Tourism Development Plan which is likely to be accelerated as Saadani National Park is increasingly promoted as a tourist destination; the park headquarters are in Mkwaja. Further changes can be expected with the planned expansion of this District to include what is now the southern coastal portion of Muheza District.

2.4.3. Tanga City

By definition, Tanga City is a 'different type' of District and as well as its own local government it is the headquarters of the Regional government. It has a very small land area (Figure 2.1) and at the time of the TCZCDP was effectively an enclave within Muheza District. It is the third largest town in Tanzania, with a long history and particular importance for its deepwater port, and as the centre of the sisal industry and an important stop-over point on the coastal route to and from Kenya. Its short coastline is the focus for many activities, and unlike the other two Districts it has deep water close to shore. The easy access to markets means that there are many important fish landing sites. The port has expanded rapidly in recent years, with over a 7-fold increase in the amount of cargo handled. In 1995 the port handled a total cargo of just over 68,000 tonnes of exports and about 33,500 tonnes of imports, with about 140 ship arrivals a year (Gorman, 1995). By 2004/2005 the port handled 498,390 tonnes of exports and 261,191 tonnes of imports, with a forecast for 2005/06 of 527,700 tonnes of exports and 323,200 tonnes of imports. Many people are drawn to Tanga for employment in factories (e.g. Tanga Cement Company, Sabuni Industries), the port, commerce, services and public services. There is a small expatriate community, largely in the private sector or retired, one focus of which is the Tanga Yacht Club, itself a significant coastal stakeholder in that it is an important centre for sport fishing and marine leisure activities.

2.5. Programme stakeholders

'Stakeholders' can be defined as the people, groups, communities and organisations who use and depend on the coastal area, those whose activities affect it, and others with a more general interest. Stakeholders may thus include local users, government agencies, NGOs, the private sector, universities and researchers, and many others. They usually include the groups with particular interests in, or who make use of, an area, and the institutions that play a role in its management (i.e. they can be individuals or organisations). The TCZCDP stakeholders were identified through a socio-economic study in Phase 1, which involved three regional level workshops (Gorman, 1995). The stakeholders have remained very similar over the course of the Programme, although the relative importance of different groups has changed.

There is considerable variation between villages according to their location and history. Thus, only 3% of villagers of remote Ushongo are involved in trade, but in Moa which is close to Tanga Town, 30% are in trade. In 1995, seaweed farming was significant in only one village (Ushongo) but by 2005, it was a major activity in several villages. There is little formal employment except in Tanga City and at the beginning of the TCZCDP, formal employment contributed little to village economies (Gorman 1995). Unemployment is high according to the 2002 National Census Report, unemployment levels are 43% for Pangani, 41% for Muheza and 58% for Tanga City.

Most coastal households depend on a combination of activities. Fishing is the most important economic activity, farming the second and trade the third (Gorman 1995), although in some villages agriculture may have primary importance (Ireland *et al.*, 2004: Appendix 6). Despite the importance of farming and fishing, the region is not self-sufficient in food, with rice, maize, other grains and beans being imported by registered agricultural traders, making it difficult for local farmers to sell their produce. Most people are below or close to the poverty line, reflecting the national situation where an estimated 85% of people living on the coast survive on less than US\$1 a day (Ruitenbeek *et al.*, 2004).

The following represent the main sectors:

- **Fisheries sector:** this includes both artisanal and commercial stakeholders, such as the artisanal fishers (mainly men), artisanal fish processors (mainly women), commercial processors, traders and exporters of marine products, prawn trawlers, and others (see Chapter 5).
- **Farmers:** subsistence farming is mainly carried out by women, while men are responsible for cash crops such as coconuts and cashew (see Chapter 7).
- **Trading:** includes both men and women and involves fish trading, small businesses such as restaurants and shops (*dukas*), importing goods such as clothes and domestic utensils;
- **Timber and poles:** e.g. mangrove pole cutters
- **Boat building and house building**
- **Sisal:** Nationalisation of half the sisal estates in 1976, combined with the development of synthetic materials, led to a decline in production from 134,000 tonnes in 1970 to 26,000 tonnes in 1990; in 1995 the industry employed 15,000 people. Figures have not been obtained for subsequent years, but the industry is reportedly showing an upturn, due to increased use of sisal but production is still small (27,794 tonnes in 2005, with only 13,954 individuals employed (information from the Tanzania Sisal Board Report, 2005). The TCZCDP held one meeting with the sisal industry in Phase I, but although this is a major economic sector in the Districts, it does not have any direct involvement with coastal resource management.
- **Tourism:** Currently a minor activity but with increasing potential (see Chapter 7).
- **Salt producers:** salt production is an important activity in the coastal villages, but the industry was not involved extensively in the TCZCDP (see Chapter 7).
- **Seaweed farmers:** predominantly women, but men are playing an increasing role in this rapidly expanding sector, as described in Chapter 7.

- **Lime production:** Before 1994, lime was produced by burning live and dead coral using wood for fuel, and was thus highly destructive. Mwambani, one of the TCZCDP pilot villages, was the main centre, and the Programme helped to halt this activity completely; lime is now produced commercially using mined fossil coral, and powered by electricity or oil.
- **Sport fishers and Tanga Yacht Club:** described in Chapter 5
- **Expatriate residents:** largely retired or involved in the private sector.
- **Government agencies:** described in Chapter 9.



2.6. Biodiversity

Despite its name, the TCZCDP was not primarily a conservation programme, but the importance of this part of Tanzania's coast for biodiversity was fully recognised from the beginning. The coastline and inshore waters of Tanga Region have been rated as 'Ecoregionally Important' by WWF's Eastern African Marine Ecoregion programme (WWF EAME, 2004), a fact further emphasised by the presence of two protected areas in Pangani District:

- Saadani National Park, upgraded in 2004 to national park status from the Saadani Game Reserve, and now including a 70 km² marine extension;
- Maziwe Island Marine Reserve, which was declared in 1981.

Coral reefs and mangroves are described in Chapter 6. There are numerous and extensive seagrass beds but these have not been documented. The region is also home to the endangered dugong and the extraordinary living fossil fish, the coelacanth, as described below.

2.6.1. Dugong and other marine mammals

Dugong *Dugong dugon* are reported to have been relatively common until the late 1970s, and were often caught for food. A protected species under the Fisheries Act of 1970 and the Marine Parks and Reserves Act of 1994, a small population may still exist at Mbayae/Kigomeni areas south of the Kenya border near Kwale and Moa in Muheza District where they were sighted in 1994 and in 2002 (Muir *et al.*, 2003). Dugong may also still occur in Pangani, as there have been reports of a gillnet capture (the main threat) from Buyuni in March 1999. In May 2006, a dugong was sighted by divers around Kigombe in a seagrass bed at about 10m depth.

Dolphins are seen regularly, the most common species being the Spinner *Stenella longirostris* and Humpback (*Sousa chinensis*) Dolphins. Humpback whales, *Megaptera novaeangliae*, pass by on migration in August and September.

2.6.2. Birds

Tanga Region is noted for its coastal bird fauna, with important species including the Greater Sand Plover, Curlew Sandpiper and Crab Plover. A 1989/90 survey recorded some 300,000 waders in the Region. Salt pans with undisturbed mangrove and sand dunes provide good habitat for migrant waders, feeding and roosting during high tides. Two Important Bird Areas (IBAs) as defined by Birdlife International occur in the region: Tanga North (IBA 35) at Kibo salt pans, and Tanga South (IBA 36) from Mwarongo salt works to the sandy spit at the mouth of the Koreni River (Baker and Baker, 2002).

2.6.3. Marine Turtles

Certain parts of the coast are important as marine turtle feeding and nesting areas, particularly in Pangani. Maziwe Island, lying 8km southeast of the mouth of the Pangani R, was once the most important nesting ground in East Africa for three species of turtle: the olive ridley (*Lepidochelys olivacea*), green turtle (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricate*) (Frazier, 1974; Shedd, 1974). In 1974, more than 25 females were nesting there, the highest concentration of nesting turtles in Tanzania. Since then all vegetation has been lost, and the island is now a bare sandbank which is submerged at high tide (Fay 1992), preventing successful nesting, although attempts are still made. A second important turtle nesting area is Madete, south of Mkwaja, in Saadani National Park where nests are being protected. Since daily monitoring by SANAPA and Sea Sense started in 2005, an average of 12-15 green turtle nests are recorded annually at Madete. Section 13 of the 1989 Fisheries Regulations prohibits the taking of turtles. The main threat is incidental and deliberate capture in gillnets.

2.6.4. Fishes

The Region has a highly diverse fish fauna. Reef fishes are described in Chapter 6. There are also significant populations of large pelagics, including the marlin, which makes the area important for sport fishing.

One of the most notable fish in the region is the coelacanth *Latimeria chalumnae*. The presence of this was unknown to government staff and scientists at the start of the TCZCDP, although possibly fishers had caught it previously and been unaware of its significance. In 2004, fishers from Kigombe caught four specimens when using shark nets, a gill net regularly used in this area (see Chapter 5), set on the sea bed at depths ranging from 50 to 200m. Since then specimens have caught all too regularly and, as of August 2007, at least 30 have been captured, and others may have gone unreported. They have been caught mainly in Mtanga'ata and Mwarongo-Sahare Collaborative Management Areas (see Chapter 4). Catches have tended to coincide with the prawn trawlers operating in these areas. Given the threatened status of this species and the lack of information on its population size and distribution (the only other record for Tanzania is Kilwa), the communities agreed with the National Coelacanth Taskforce and the TCZCDP to close the area where coelacanths have been caught to fishing and trawling. In January 2005 the Director of Fisheries delegated the management of this area to the communities, Districts, and Region, and authorised them to take all necessary action to prevent further catches. A joint initiative is therefore underway by the Muheza District Council, Mtang'ata Collaborative Management Area committee, and the villagers of Kigombe to develop a management plan with the aim of creating a Coelacanth Conservation Area. This initiative is being supported by the African Coelacanth Ecosystem Programme (ACEP) based in Grahamstown, South Africa.

CHAPTER 3. HISTORY AND STRUCTURE OF THE PROGRAMME

Solomon Makoloweke, Kath Shurcliff, Trudi van Ingen, Melita Samoilyls and Sue Wells

3.1 Introduction

The evolution of the TCZCDP illustrates the time involved in taking a programme of this size from initial conception to funding. In the mid-1980s, the Tanga Regional Administration was becoming concerned about the decline in fish stocks and the damage being caused to reefs by dynamite fishing. The Regional Fisheries Officer approached IUCN which was supporting an agro-forestry programme in the Eastern Usambaras, close to Tanga. At that time, IUCN had no marine programme in its Eastern African office but this was in place by 1987 and it agreed to assist.

A preliminary survey was undertaken, funded by NORAD and involving scientists from the region and local community participants who contributed to the subsequent proposal development (Bensted-Smith, 1988). Based on this information, IUCN prepared a proposal concept in 1989 and started to look for donors. GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit), the German technical cooperation, who were already involved in Tanga Region, tried unsuccessfully to find funding in Germany⁵. Following a further visit, meetings with Regional staff, and brief surveys of reefs and turtle nesting, all of which confirmed the serious environmental destruction that was taking place, IUCN rewrote the proposal in 1992. This was presented at the Rio Summit, and caught the interest of Irish Aid, which had environment as part of their portfolio.

This first proposal was heavily oriented to awareness raising and community development, but IUCN felt there was need for a biodiversity component. In addition, a study by the UK-based Natural Resources Institute on urban planning and health related issues had highlighted the potential impact of sewage outflows from Tanga Town into the bay, which led to interest by the National Environment Management Council (NEMC) in land-based issues affecting the region. At a workshop in Tanga in 1993, it was realised that an integrated coastal zone management (ICZM) programme was needed. The proposal was revised with this new emphasis. A timeline of 10 years was also added, since it was recognised that this was essential in order to show significant changes due to management and to develop the Regional and District governments' capacity. With these changes, Irish Aid agreed to funding the Programme in 1994.

This planning and design process thus took several years to complete, but was collaborative and participatory which helped to ensure ownership by the key players: Tanga Regional government, and subsequently the District governments; Irish Aid and IUCN. Furthermore, the TCZCDP had several important and, at the time unusual, elements:

- ICZM, and the integration of biodiversity protection with sustainable development objectives;
- A 10 year time frame, in several distinct phases, each contingent on evaluation of the previous phase and readjustment as appropriate;

⁵The proposal emphasised stopping dynamite fishing, which was misunderstood to mean military-type interventions

- Provision for a strong technical advisory team which would decrease over time, as government teams improved their own capacity for ICZM;
- Technical advisers whose principal role was to assist and mentor Regional and District government officers to implement the programme;
- A Steering Committee that could make decisions about changes in the Programme's work plans and budgets.

3.2. Programme design and approach

The TCZCDP was first conceived as a Regional ICZM initiative, as ICZM was seen as essential for the successful management of marine and coastal resources. However, it rapidly became apparent that the limited experience and skills of local government staff and residents, as well as the impending decentralisation of government, required a simplified approach. Nevertheless, the central focus remained the improvement of the quality of life of coastal communities, which was to be achieved by (a) improving the health of the ecosystems and environment on which people depend, and (b) diversifying the options for use of coastal resources.

Government staff, initially at both Regional and District levels, and increasingly at District level, undertook Programme activities, with technical assistance from IUCN and local and international consultants. In Phase I, six Regional Advisers and three District Co-ordinators (DCs), with other District staff, were directly associated with the TCZCDP. With decentralisation, the Regional Advisers were reallocated to the Districts. Trainers and facilitators were contracted for specific activities and the Programme employed support staff (e.g. security guards, drivers and secretarial staff) if government staff were unavailable.

A Regional Steering Committee was appointed to give overall direction and to monitor progress. This consisted of representatives from Irish Aid, IUCN, the Regional Administration, and the Districts (District Executive Directors (DEDs) and DCs), and was chaired by the Tanga Regional Administrative Secretary (RAS). It met twice a year to approve annual work plans, progress reports and budgets and to make policy decisions as required. The Committee was terminated during Phase III, when the Tanga Coastal Consultative Forum (TCCF) was established as a preliminary step to mainstreaming of the Programme. A Project Steering Committee was reinstated at the beginning of Phase IV, again chaired by the RAS, as there was a continued need for a forum to take decisions in relation to the donor funding.



Initially it was planned that there should be just two phases: a first phase to develop an ICZM plan and a second phase to implement it. However, shortly after the programme had started, it was realised that it would be better to test the approach and methods first, using a limited number of critical issues and pilot locations. The Steering Committee was able to approve this change, its flexibility being a result of its combination of organisations directly involved in the Programme. At the same

time, it also became apparent that the three District governments had not been sufficiently involved in the design phase. This took a few months to remedy, but was achieved partly as a result of the inclusion of the District Directors on the Steering Committee which gave them much greater ownership.

The Programme was re-designed to have four distinct phases, an approach that was unusual for ICZM programmes at the time. The structure was based on a model developed for the World Bank by Picciotto and Weaving (1994) that recognises the complexity, time required, and assistance needed for integrated conservation and development projects. The model has four stages:

- **Listening** - to ensure that the priority issues and actions to be addressed are those identified by the beneficiaries themselves; in this case, the resource users and the resource managers.
- **Piloting** - to test how well proposed actions actually work, and to try alternatives.
- **Demonstration** - to fine-tune and adapt processes and actions to a wider range of cases;
- **Mainstreaming** - to adopt processes, actions and methods as normal practices.



These stages are reflected in the project phases shown in Table 3.1.

Mid-term evaluations during each Phase, and external evaluations at the end allowed for reflections on the actions undertaken, methods used, and extent of achievement of expected outcomes, and thus ensured an adaptive management approach. Another key design aspect was the collaborative or participatory approach, exemplified by the involvement of all levels of society, as follows:

- **Village** - initial selection of three pilot villages for development of issue-based action plans, followed by expansion to all coastal villages
- **District** - over the course of the Programme, the Local Government Reform Programme (LGRP) was implemented, requiring that the Districts take executive responsibility for natural resource management, and thus the TCZCDP
- **Regional Administration** - initially responsible for implementation, and subsequently playing an advisory and facilitating role in the Programme
- **National** - provision of advice and guidelines through the national government agencies responsible for fisheries, forest and bee-keeping, enforcement (navy assistance), and marine reserves.

The TCZCDP played an important role in the development of national coastal management policies and structures. Two national technical workshops (1996 and 1997) were held as part of the TCZCDP during Phase I, with broad participation of the line Ministries, at which

Table 3.1. Summary of TCZCDP Phases

Phase	Dates	Stages and activities undertaken
I	July 1994 - June 1997	Listening and piloting: 'listening' consisted of participatory socio-economic and resource assessments with three villages in each District, followed by a regional workshop with other stakeholders to identify priority issues and potential solutions. Piloting involved selection of a pilot village in each District, each of which developed action plans to address two priority issues. 'Action-planning' became a core strategy for all components of the TCZCDP. Phase I also involved capacity building for government and community institutions and initiation of community-based activities, with basic surveys of fisheries, reefs, and coastal forests to assess condition, pattern of use and options for improved management.
II	July 1997 - Dec. 2000	Continue with listening and piloting, and initiate demonstration. Demonstration involved the combining of the village action plans into collaborative management area plans (CMAPs), each involving several villages. Almost all coastal villages in the three Districts were involved by the end of this phase.
III	Jan. 2001 Dec. 2003	Continue with listening, piloting, demonstration and initiate mainstreaming. Mainstreaming was aimed at continuing efforts to build capacity for implementation of the CMAPs, with a sound financial basis and professionally-managed government departments, accountable for implementing government policies and procedures.
IV	April 2004 June 2007	Demonstration, mainstreaming and exit phase. The aim of this phase was to ensure that legal, institutional, technical and financial mechanisms were in place and operational, so that the core activities required for effective coastal marine resource management can be sustained and further developed.

environmental laws were assessed, gaps and overlaps identified, and policy changes recommended. Government officials were taken into the field to see at first hand the issues faced by coastal communities. Following a visit to the TCZCDP in 1997 from CRC, with US-AID support, it was recommended that a national level programme should be initiated with CRC's support. As a result, the Tanzania Coastal Management Partnership (TCMP) was formed and given the task of developing a national coastal management policy. Once TCMP was established, it was no longer necessary for TCZCDP to host national level workshops.

The rest of this chapter summarises each phase of the TCZCDP, providing a context for the subsequent chapters. The goals, objectives and main result areas for each phase are shown in Table 3.2.

3.3. Phase I

Phase I started with Participatory Resource Analysis (PRA) training for District staff and extension workers, the latter then being made responsible for training the villagers. In March/April 1995, participatory socio-economic and resource assessments were carried out in nine villages, three in each District (Kipumbwi, Ushongo and Mkwaja in Pangani; Kigombe, Moa and Kwale in Muheza; Mwambani/Mchukuuni, Tongoni and Sahare/Mnyanjani in Tanga Municipality/City)

to identify the main issues (Gorman, 1995) (see Chapter 4). The goal, two objectives, the results to be achieved and activities to be undertaken were agreed (Table 3.2), with most of the requirements identified in the 1993 proposal included (Makoloweka and Shurcliff, 1997).

At the same time, coral reefs and mangroves were assessed, using Rapid Assessment Procedures designed following a review of similar programmes elsewhere in the East African region and through consultation with relevant experts. The results of the surveys were discussed at a regional workshop in June 1995, attended by some 120 participants, including over 50 representatives from villages and elected officials. The large number of workshop participants ensured that the TCZCDP had the support of the resource users and the communities themselves.

Each District selected one pilot village from the nine previously assessed, choosing those with a strong reliance on coastal resources and a commitment to addressing problems: Kigombe (Muheza District), Kipumbwi (Pangani District) and Mwambani (Tanga Municipality). Each pilot village chose at least two issues and developed village action plans to address these, and developed supporting by-laws (Chapter 4). The reefs were mapped and surveyed by the Technical Advisers, fisheries officers, and villagers, a Village Monitoring Team (VMT) was established, and a socio-economic survey was undertaken. These initiatives provided information that was used to identify potential management areas, provide evidence for common resource use and common issues across villages, negotiate management procedures and provide feedback to villagers.



The main interventions, discussed in subsequent chapters, related to fisheries and mangrove management, agriculture and mariculture training and trials, the establishment of a Community Development Fund, improvements to policy, legislation, and law enforcement, and a gender training programme. Since beach pollution was also identified as an important issue, funding was provided for the three pilot villages to build 65 cheap latrines and over 150 rubbish pits. Fuel-efficient stoves were also introduced to address the fuel wood shortage. These particular activities were not subsequently supported but were valuable in gaining the confidence of the communities in the early stages.

Phase I was evaluated by an independent external team in February 1997 (Meltzer *et al.*, 1997) and recommendations were developed for Phase II.

3.4. Phase II

In line with the general approach of the Programme, a participatory planning process was used. Each pilot village evaluated Phase I and made their own recommendations. The extension workers undertook a similar evaluation. Each District Technical Team, with representatives of the village committees and extension workers, developed a logframe, with assistance from the Programme team. A planning team, with representatives from each of the partners, then formulated the final logframe and funding proposal using the materials and information that had been produced.

The objective was made more specific, with institutional capacity strengthening and sustainable resource use by communities linked to the establishment of collaborative management. There were 10 specific Results (Table 3.2). The aim was to consolidate and build on the successes of Phase I, start the “demonstration” stage, fine-tune and adapt processes and actions to a wider range of cases, and develop cost sharing arrangements. The main activities were: further decentralisation to Districts, extending the collaborative management processes to 12 villages; studying potential cost-sharing arrangements; piloting new activities e.g. in agriculture and mariculture; environmental education; and continued promotion of the role of women.

The mid-term review in April 1999 (Kelleher, 1999) resulted in some significant changes. It found that although the TCZCDP had been successful in many areas, the logframe, objectives and anticipated results were too broad and complex, and efforts had been spread too thinly. There were two major recommendations: the TCZCDP should be restructured to speed up decentralisation; and it should focus on its main strengths, namely collaborative marine natural resource management. The Overall Goal was therefore made less ambitious, the objective was rephrased, and the 10 result areas were reduced to five (Table 3.1). The pilot village approach was dropped and focus was put on expanding collaborative fisheries management to a larger number of villages. Support for income generating activities was reduced to a few specific issues such as seaweed farming. One component of the Programme (result 5) concentrated specifically on decentralisation and developing the human, institutional and financial capacity needed in the Districts.

The final evaluation (Grindle and Ngoile, 2000) concluded that solid foundations for collaborative management had been laid, and recommended that Phase III should consolidate the approaches and aim to demonstrate the impact. The overriding recommendation was to “keep it simple”. Other components previously considered important, such as alternative income generating opportunities, were considered to be beyond the scope of the TCZCDP.

3.5. Phase III

A three-day workshop with a wide range of stakeholders was held to plan Phase III. Each District prepared its own logframe taking into account the Phase II evaluation findings. The overall logframe was generated at a later workshop, facilitated by IUCN (see Table 3.1.). Phase III focused on demonstrating approaches that had been successfully tested, and mainstreaming, with particular on two priorities:

- Continued support for the CMAPs (i.e. review of the existing CMAPs and expansion to cover the entire coast): activities included continuation of capacity building work, awareness-raising and sharing experience at local, national and international meetings; development of a Regional Coastal Resource Centre (RCRC); and feasibility studies on financial sustainability.
- Strengthening of the monitoring/recording systems in order to measure results and impact: this was considered sufficiently important that, although recognising routine monitoring and evaluation as a cross-cutting issue, it was also made a specific result area. Particular attention was paid to revision of the reef monitoring and fisheries data collection programmes.

The mid-term evaluation for Phase III (Richmond *et al.*, 2002) recommended greater focus on enforcement, monitoring, gathering of key baseline information (e.g. maps) and mainstreaming. A final evaluation was undertaken in June 2003 (Dawson Sheppard, 2003), and a follow-up mission was made shortly after to review and corroborate its findings (Grindle, 2003). The recommendations led to the identification of priority interventions for Phase IV. Recommendations to mesh the CMA boundaries with the District boundaries, to support livelihood activities, and to identify risks from population increase and climate change were not taken up, but are referred to in later chapters.

3.6 Phase IV

Planning for Phase IV started in mid-2003, and involved a series of meetings including a two-day workshop for District officers from the three Districts (Tanga, Muheza, Pangani) to develop a draft logical hierarchy, six village-level meetings facilitated by community development officers and an independent facilitator, and a Regional-level workshop at which the draft plan was produced. In January 2004, the plan was redesigned to provide for the withdrawal of IUCN at the end of the first year (March 2005) as requested by the RAS. The Phase IV plan was approved in April 2004 (IUCN 2004a).

The Goal and objective used in Phase III were considered to be suitable for Phase IV, but the Phase III evaluation recommended a simpler logframe, with clearly defined deliverables and target dates. The aim of this final Phase was to achieve sustainability and to mainstream TCZCDP activities into all levels of government structure (village, District, Regional and national) so that Programme activities were harmonised with existing work plans. The focus was on building the capacity to ensure long-term implementation of the CMAPs, enhancement of the environmental and socio-economic knowledge base and the development of financial sustainability (Table 3.2). The Phase III evaluation had identified priorities that were reflected in the activities undertaken:

- Further strengthening of the CMAPs: including improving government services to the local communities involved in management of the CMAPs, strengthening the understanding of the collaborative nature of the CMAPs, and increasing their national recognition through legislation and policy
- Simplification of the monitoring programme: monitoring and assessment methods were reviewed, standards and indicators recommended, and an information management system developed
- Identification of sustainable financing mechanisms: opportunities for financial support to village level institutions were explored; recommendations of the revenue generation consultancy were followed up
- Institutional capacity needs assessment: to determine capacity needs for implementation of the core activities of TCZCDP.

The first year of Phase IV was evaluated at the beginning of 2005 (Lewis and Juma, 2005), shortly before IUCN technical support ended. It was recommended that the main activities already underway for this Phase should be continued, notably implementation of the CMAPs, full integration of TCZCDP operating procedures into standard local government procedures, training and capacity development to bring all three Districts to the same level in terms of coastal zone management; and that dynamite fishing be addressed with the communities.

The gradual transition from a donor-funded project to a mainstreamed, District government led, coastal management programme had been envisaged from the beginning of the TCZCDP and was reflected in the model of Picciotto and Weaving (1994) that formed the basis of the project design: listening, piloting, demonstrating and mainstreaming. 'Mainstreaming' was thus, in effect, to be the exit strategy. As early as the Phase II final evaluation, it was recognised that a three-year Phase IV would be needed for this process, and it was recommended that this Phase should be 'low-input' and focus exclusively on hands-off monitoring and evaluation.

By Phase III however, the need for a more defined, specific exit strategy had become apparent, to ensure a smooth transition from a situation of donor funding and external technical assistance to one where activities are supported and led by the Districts. Sustainability in terms of both technical and financial capacity had proved more difficult to establish than expected, and some key personnel and stakeholders found it difficult to

understand that the donor-funded project was to evolve into a permanent set of activities to be undertaken through existing institutional mechanisms. Although the aim was to finalise the exit strategy by the end of Phase III, this was not possible until the end of the first year of Phase IV (IUCN/GoT, 2004). The exit strategy laid out which institutional bodies are responsible for the various coastal management activities previously undertaken through the 'project' structure. It also emphasised the importance of a formal handover of the Programme to the Government of Tanzania, so that all those involved are fully aware of their new commitments and responsibilities.

IUCN ceased providing technical assistance in March 2005, when responsibility for management of the Programme activities was handed over to Regional Secretariat and District Councils, with the Regional Fisheries Adviser taking over the functions of the IUCN Technical Adviser. The handover was celebrated in a formal ceremony in April 2005 in Tanga. A Letter of Agreement outlining the key obligations for each partner was signed by the Government of Tanzania, Irish Aid and IUCN-EARO in May 2005, and detailed arrangements for the transfer of management responsibilities to the Districts were drawn up (IUCN, 2005a). A new Steering Committee was established for the remaining two years of donor funding, along with a Regionally-staffed Support Unit.

The first thing the Programme did between April and June 2005 was to change the Programme planning system to the Government of Tanzania planning format and synchronise the Programme's planning cycle to the Government fiscal year. In general, enforcement and resource monitoring continued through to the present despite intermittent flow of funds at times. In June 2007, funding from Irish Aid ceased. Activities are now continuing with funding from Central Government. This supports a Fisheries patrol unit stationed in Tanga for enforcement and fisheries data collection. Local Government through the Districts also contribute to Programme activities including resource monitoring and maintenance of the patrol boats.



Table 3.2. Goals, objectives and result areas of each Phase of the Programme

Objectives	Result areas
<p>PHASE I Goal: To safeguard the resources of the Tanga Region coastal environment for the benefit of present and future generations of residents, through a series of integrated activities aimed at protection, sustainable use and management of coastal zone resources</p>	<p>Proposals developed for regional and district co-ordinating agencies Established forum to promote participation of all key stakeholders Regional, district and village governments running resource management activities Streamlined prosecution system for control of illegal use or harvesting of coastal natural resources Pilot villages empowered to control destructive and illegal practices District governments actively support collaborative management with village governments Community development fund in place stimulating more sustainable use of resources throughout the coastal area Submissions made to national authorities for policies and legislation to support regional programme activities Phase II implementation plan and integrated strategies for improved coastal management</p>
<p>Build the capacity for integrated management of the coastal zone by working with regional and district resource management and planning authorities, and community leaders Proposals developed for regional and district co-ordinating agencies</p>	<p>Baselines established for monitoring status of coastal resources and their uses Working examples of coral reef management established Working example of mangrove management established by coastal communities in collaboration with government Working examples of management of coastal forests and wildlife established by coastal communities in collaboration with government Increased economic opportunities and alternative resource uses made available in the coastal area Working example of beach pollution control in place Working examples of villagers controlling coastal erosion</p>
<p>Working with coastal communities to restore degraded environments, strengthen or revive traditional resources management and tenure systems, and implement management of coral reefs, mangroves, coastal forests and wildlife</p>	<p>Working with coastal communities to restore degraded environments, strengthen or revive traditional resources management and tenure systems, and implement management of coral reefs, mangroves, coastal forests and wildlife</p>
<p>PHASE II Part 1. Goal: Sustainable use of the coastal resources of the Tanga Region for the benefit of present and future generations of residents, as well as other people and programmes in Tanzania and the Eastern Africa Region generally (achieved through a series of integrated activities aimed at conservation and collaborative management of coastal resources)</p>	<p>Three coastal districts coordinating and implementing coastal resource management. Region facilitates, supports coastal districts to implement coastal resources management and links the districts to central government, IUCN, Irish Aid and others Regional and District staff working to professional standards Effective system of village based enforcement operating in all Programme villages</p>
<p>Three coastal Districts with established programmes of collaborative resource management that improve the well - being of the coastal communities and their environment in the programme village</p>	<p>Three coastal districts coordinating and implementing coastal resource management. Region facilitates, supports coastal districts to implement coastal resources management and links the districts to central government, IUCN, Irish Aid and others Regional and District staff working to professional standards Effective system of village based enforcement operating in all Programme villages</p>

	<p>Communities empowered to undertake collaborative management of coastal resources in all Programme villages</p> <p>Gender considerations integrated at all levels of Programme planning, management and implementation</p> <p>Monitoring, evaluation and reporting procedures defined and being implemented at all Programme levels</p> <p>Livelihoods of coastal communities improved through use of sustainable fishery practices</p> <p>Conservation, equitable access to, and sustainable use of forest resources secured for the coastal villagers</p> <p>Improved and sustainable agriculture practices promoted as alternative coastal resource use</p>
<p>Phase II Part 2. Goal: Sustainable use of coastal resources in Tanga Region's coastal districts</p>	<p>Sustainable fisheries conservation and management measures introduced and implemented in each coastal district in Tanga Region</p> <p>Sustainable and improved mariculture and agriculture practices introduced and implemented as alternative sources of income</p> <p>Communities empowered to undertake collaborative management of coastal resources</p> <p>Improved equity between men and women in management and sustainable use of fisheries and related resources</p> <p>Institutional capacity for ICZM enhanced and used in the districts</p>
<p>Phase III Goal: Integrity of the Tanga coastal ecosystem improved, and its resources supporting sustainable development</p>	<p>Improved capacity of key stakeholders and local institutions for collaborative coastal and marine resource management, conservation and monitoring</p> <p>Collaborative coastal and marine resource management plans developed, implemented and monitored</p> <p>Key stakeholders aware of coastal zone management issues and values and using information to improve management</p> <p>Programme effectively managed, monitored and evaluated</p>
<p>Phase IV Goal: Integrity of the Tanga coastal ecosystem improved, and its resources supporting sustainable development</p>	<p>Tanga coastal ecosystem improved, and its resources supporting sustainable development</p> <p>Institutional support strengthened to enable long term implementation of collaborative management area plans</p> <p>Environmental and Socio-economic knowledge base strengthened and supporting decision making and adaptive management</p> <p>Programme effectively managed</p>

CHAPTER 4: COLLABORATIVE MANAGEMENT AREA PLANNING

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4.1 Introduction

Central to the TCZCDP has been the establishment of Collaborative Management Areas (CMAs) and the extension of this approach to two mangrove forests. The fundamental basis of a CMA is that management is by the resource users, with each CMA comprising the “home” fishing grounds shared by a group of villages, or a mangrove forest shared between two or more villages. This chapter describes the CMAs and the collaborative mangrove management areas, the plans used for their management, the process used to set them up, and their relationship to other planning activities in the Districts.

4.2. Collaborative Management Areas (CMAs)

The six CMAs, cover the entire coastline of the three Districts and extend to the 12nm. territorial waters limit (Figure 2.1). They vary in size from just under 100km² to 400km² (Table 4.1). The total area covered is 1,604km², which is slightly smaller than the area of the continental shelf (2,090km²). The CMAs vary in bathymetry, in extent of reef, mangroves and seagrass beds, and thus in the type and area of fishing grounds. They also differ in the number of villages involved and the number of fishers and boats using the grounds.



Table 4.1. Key features of the CMAs; pilot villages marked in bold

Name	District	Villages	Wards	Size km ²	Developed/ reviewed	Approved by DoFi
Boma- Mahandakini	Muheza	Vuo B., Mwachala, Mwaboza, Zingibari, Moa, Ndumbani, Mayomboni, Mahandakini (8 villages, 5 landing sites)	Moa	145	2000 reviewed 2003	2001
Deep Sea- Boma	Tanga Muheza	DeepSea, Kisosora, Ndaoya, Chongoleani, Kizingani, Kwale, Monga/Vyeru, Kichalikani, Doda, Kibiboni, Mwandusi Mtundani, Tawalani Manza, Boma Subutuni, Boma Kichakamiba (14 villages, 13 landing sites)	DeepSea Kwale Kichalikani Mwandusi	377	2000 reviewed 2003	2001
Mwarongo- Sahare	Tanga	Mwarongo, Geza, Tongoni, Maere, Machui, Mchukuuni, Mwambani , Ndumi, Mnyanjani, Mtambwe, Kiungani, Sahare (12 villages, 20 landing sites)	Tongoni Machui Mwarongo Sahare	96 1	1999 reviewed 2003	2000
Mtang'ata	Muheza, Tanga	Kigombe , Mwarongo, Geza, Maera (4 villages, 3 landing sites)	Kigombe	97	1996 Reviewed 1998 & 2001	1999 2004
Boza-Sange	Pangani	Boza, Pangani East, Pangani West, Bweni, Ushongo, Stahabu, Kipumbwi , Sange (8 villages, 8 landing sites)	Pangani Kipumbwi Ushongo Stahabu	400	1996 reviewed 2001	1999/2000 2004
Mkwaja- Sange	Pangani	Mkwaja, Mikocheni, Sange (3 villages, 3 landing sites)	Mkwaja	389	2000 reviewed 2001	2001 2004

As agreed by the communities, the landward boundaries were defined by the mean high water mark and the seaward boundaries by a line connecting the reef base of the seaward side of the outermost series of reefs (about 300m from the reef edge). The straight lines of the boundaries made for easier enforcement. The northernmost and southernmost CMAs have their northern and southern boundaries defined respectively by the national boundary with Kenya and the boundary between Pangani and Bagamoyo District. Boundaries between the CMAs were determined through a negotiation process and represent the point where there is the smallest amount of overlap in resource use by different villages.

The first CMA was *Mtang'ata*, which was initially known as Kigombe-Tongoni and was developed from the initial 1996 village action plan to address destructive fishing for Kigombe. The second CMA was Boza-Sange which initially comprised two CMAs: Kipumbwi-Sange (developed from the village action plan for Kipumbwi) and Pangani-Kipumbwi. These were combined in 2000 when it was found that the same communities used both areas. Mtang'ata CMA is also the location of the proposed Coelacanth Conservation Area.

Mwarongo-Sahare CMA was the first to be established directly using the collaborative process involving several villages (see below). It covers an area of high fisher density, involves 14 communities, 12 of which are rural villages and two of which are urban suburbs, and has both small and larger scale fishing activities. It has the deepest water (over 100m deep) of all the CMAs, and 20 landing sites, reflecting the fact that it lies around Tanga City and is thus closest to markets.

The remaining three CMAs were established in 2000. Mkwaja-Sange, the southernmost CMA, has primarily shallow waters (less than 100m deep throughout), a straight coastline with sandy beaches and a small fisher population. A portion of it is included within the marine extension of Saadani National Park.

Boma-Mahandakini and *DeepSea Boma* are the northernmost CMAs and have highly indented and mangrove fringed coasts. *DeepSea Boma* involves the greatest number of villages. *Boma-Mahandakini* is planned ultimately as a cross-border management area with Kenya, recognising that resources and their use cross the national boundary. Meetings were held in 2004 between relevant local authorities (e.g. Vanga (in Kenya) and Moa (in Tanzania)). On the Kenya side, to date only the Fisheries Department has been involved and there is a recognized need to involve the national level ICAM Secretariat, in the same way that TCMP is involved in the TCZCDP. The creation of the East African Community (EAC) in 2000 and discussions through this on joint management of natural resources may help to promote the establishment of cross-border arrangements.

4.2.1. Development of the CMA concept

The process for establishing the CMAs evolved over a series of stages as shown in Table 4.2 and described in more detail below.

4.2.1.1. Single village action and fishery management plans

At the beginning of the Programme, the prevailing understanding, based on the findings of the socio-economic survey in 1995 and knowledge of community level projects elsewhere (e.g. Duruhaitemba forest project in Manyara region and Fumba, Zanzibar), was that individual communities or villages had exclusive rights to certain resources and areas, and that these were managed through the village government. Village action plans were therefore developed in the three pilot villages (Kibumbwi, Kigombe and Mwambani-Mchukuuni) in February 1996. The key feature of these are that the plans are compiled by identifying the issues or problems affecting villagers, along with their consequences and causes, and then determining potential solutions⁶.

⁶ This approach, also known as the 'animation approach' was adapted from a method developed in West Africa by G.R.A.A.P (Groupement de Recherche et d'Appui à l'Autopromotion Paysanne). Similar "animation" methods were also in use by the German-supported Village Development Project (VDP) in Tanga and by the district development programmes of Irish Aid; a VDP trainer was used for some of the initial training work.

Table 4.2. Summary of Evolution of CMAPs

1. Pilot village action planning	2. Fisheries management plans with pilot village plus neighbouring villages	3. CMAPs with nested village action plans
<ul style="list-style-type: none"> • Three pilot villages in three Districts • Villagers' issue identification, problem analysis and plan formulation • Villagers' capacity building, and ownership • Action plans and Village Committees for each selected issue (3-4 per village) • Quarterly feedback meetings in the village 	<ul style="list-style-type: none"> • Two pilot villages plus surrounding villages • Neighbouring villages involved in a passive way • Pilot village leads issue identification, problem analysis and plan formulation • Plan addresses shared marine and coastal management issues • Number of committees reduced to two per village • Quarterly feedback meetings conducted in pilot village only • Annual review of management plan with pilot and neighbouring village 	<ul style="list-style-type: none"> • Six collaborative management areas and plans involving 49 villages • All villages are equal partners in plan preparation and implementation • CMAPs address issues of fisheries and related coastal resource use • Roles and responsibilities among institutions clearly specified • Only one Committee per village (VeMC) • Periodic review (not necessarily annual) of management plan with collaborating villages • Validity of some CMAPs is indefinite

Seven common issues were identified as problems in most villages (Gorman, 1995):

- *Declining fish catches* caused by fishing with dynamite, use of small mesh nets, commercial trawlers, over-fishing, lack of appropriate gear, mangrove cutting, increased number of consumers, pollution, poverty, and lack of law enforcement;
- *Coastal erosion* caused by mangrove clearance;
- *Scarcity of fuel wood and building materials* caused by tree cutting for salt boiling, increased demand for wood for domestic use, and unregulated mangrove and other timber cutting;
- *Low agricultural production* caused by vermin, inadequate farming implements and lack of expert advice;
- *Failure to manage natural resources/poor enforcement* caused by inaction of both government and community members;
- *Beach pollution* caused by human waste and sisal factories (see section 4.3.1);
- *Lack of basic social and financial services (e.g. credit facilities) in most villages.*

Each pilot village chose at least two issues to work on. All three selected declining fish catches; Kibumbwi and Mwambani-Mchukuuni also chose vermin control, and Kigombe chose beach erosion. The villages then set up gender-balanced committees for each issue. Committee members were trained in planning, monitoring, and feedback mechanisms, and with the help of the extension workers, they looked at the causes, consequences and actions needed for each

received help from the District teams of officers for fisheries, forestry, and community development, and several went on study tours. By the end of Phase I, there were 10 village committees in the three villages, each preparing their own action plan. The villages also took the lead in developing by-laws, which were approved by their Districts.

The planning process was simple to understand and implement, transparent and highly participatory with many people involved, including women. However, the rather limited analysis that took place did not always lead to identification of the right solutions, and there was a proliferation of committees, with one being set up for each issue and plan.

Following the coral reef and fisheries survey, a more thorough analysis of problems, causes and solutions related to fisheries and coral reefs was possible. By 1997, Kigombe and Kipumbwi had developed broader-based village fisheries management plans to replace the initial plans for destructive fishing. These involved a more thorough analysis and negotiation process, included elements such as protected areas, village monitoring teams, village by-laws, and were subject to a more formal organisational agreement. At first the original village action plans continued to be operational alongside the fisheries management plans, but later the number of issues was reduced, and fisheries and mangrove management were combined in environmental management plans. Mwambani-Mchukuuni did not develop a general fisheries management plan but it had a plan to combat destructive fishing.

Once the plans were being implemented, the village committees reviewed what progress and discussed solutions to solve new problems at quarterly meetings that were attended by District officers, extension workers and representatives from the other pilot villages. Initially the plans were for a year, with an evaluation and revision every six months.

4.2.1.2. Multi-village fishery management action plans

The individual villages felt strong ownership of the plans but since the fishing areas were shared with neighbouring villages, disputes arose. This planning approach also led to neighbouring villages perceiving the pilot villages as having a privileged position. The planning process for Kipumbwi and Kigombe was therefore adapted to involve consultation with their neighbours (i.e. Mwarongo and Tongoni in the case of Kigombe, and Sange, Stahabu, and Ushongo in the case of Kipumbwi), so that inter-village issues such as dynamite fishing and reduced catches could more effectively be addressed. The number of committees was reduced to two per village: one on fisheries, and one on other environmental issues - the Village Environment Management Committee (VEMC). The latter are statutory bodies under the Local Government Reform Act, responsible for representing individual village interests and implementing village-based activities related to environmental issues. Kipumbwi also had a mangrove committee because of the development of a mangrove area management plan (see below). The annual review involved all those villages involved in a plan.

Although this new process worked well for Kipumbwi, resulting in the 'Kipumbwi-Sange' plan, at Kigombe the villagers perceived the plan to be theirs, a problem exacerbated by its name: the Kigombe Collaborative Fisheries Management Plan. The villages of Tongoni and Mwarongo did not have full decision-making powers, their role being limited to consultation. During the first review of the plan in 1998, the villagers of Kigombe and those of Mwarongo and Tongoni disagreed over the proposed continued closure of Kitanga and Upangu reefs (see section 4.1.4). The Kigombe villagers tried to reopen these reefs against the wishes of the others by claiming

that the plan was principally theirs, and that the other villages had only agreed to it. Villagers of Tongoni and Mwarongo said they had equal rights in the plan as they had equal rights to the resources. Although the majority view to keep the reefs closed prevailed, Kigombe village government unilaterally opened the reefs shortly before the second review in 1999. This decision was politically driven by forthcoming village elections, as Kigombe villagers had reported increased catches and had even been taken to the reefs to observe the higher fish densities on the closed reefs.

4.2.1.3. Collaborative Management Area Plans (CMAPs)

The planning process was adapted a third time in December 1997, so that all villages using an area were actively involved in identifying the main issues, causes, solutions, and developing the plan. This is achieved through the election of 1-2 representatives from each village to form a Central Co-ordinating Committee (CCC). All plans negotiated after 1998 have a section that stipulates the agreed roles and responsibilities of the VeMCs and the CCC: the former represent individual village interests and implement village based activities; the latter facilitates agreement between villages and harmonises the village action plans, determines common rules, penalties and by-laws, resolves inter-village disputes, provide feedback to villages, assists with monitoring and evaluation of the CMAPs, and co-ordinates enforcement patrols.

The Mwarongo-Sahare CMAP was the first to be produced directly using this approach and quickly demonstrated its value. The CCC was able to gain consensus on a potentially contentious closure of a section of reef and managed to deal with inter-community issues despite village elections that led to a change of governing political party in some cases. Further support for the success of this approach comes from the fact that the former pilot village of Mwambani, which had previously rejected the efforts of its own village committee to formulate a management plan, is now involved.

4.2.2. Preparing a CMAP

The CMAPs, like the village action plans, are drawn up by villagers who were assisted initially by IUCN Technical Advisers and now by relevant District officers. The generic structure is shown in Box 4.1. and the Objective and Results for each CMAP are summarised in Tables 4.3. and 4.4.

Five of the CMAPs have increasing income through the use of marine and coastal resources as the main objective; one (DeepSea Boma) has increasing the resources per se as the main objective. The focus on marine and coastal resources, rather than broader issues, reflects the fact that by the time the CMA approach had developed, the TCZCDP was focusing largely on marine issues. Each CMAP has 4-8 Results. All have Results relating to reduction in illegal fishing, since the main issue in all communities was decreasing fish catches and income, although the perceived causes of this varied. Five CMAPs have a Result relating to increased seaweed production; three have Results relating to improving mangrove management; and two have Results relating to turtle protection.

The process that has evolved to prepare the CMAPs, can be summarised as follows:

1. A survey, using PRA, is carried out in the area of the proposed CMAP to determine biophysical and socio-economic characteristics, the stakeholders, and how the latter use the resources. The data are analysed and discussed with the villagers to ensure consensus. A report containing the results and relevant data may be prepared.
2. A chart or map of the area is prepared to show key features and natural resource use.
3. The CMA area is negotiated and delineated, the participating villages defined, and the boundaries demarcated.
4. VEMCs are elected if not already in place. The election process involves consultation with village government, awareness raising among villagers, and finally election of members by the villagers.
5. The CCC is elected, comprising representatives of each VEMC. CCCs have no statutory mandate but are recognised through the District by-laws.
6. Village Action Plans are prepared by the VEMCs with assistance from District staff, using the results of survey work and monitoring. The plans are presented to the Village Assembly for comment and approval and after any revisions, the approved final Village Action Plan is sent to the CCC by the Village Council.
7. The CCC integrates the Village Action Plans into a draft CMAP, which is sent back to the villages.
8. The Village Governments present the draft to the Village Assemblies who either approve it or pass their amendments to the CCC. The CCC reviews all comments and revises the CMAP prior to resubmitting it to Village Governments for final approval. The CCCs send the approved CMAPs to the Ward Development Committee(s) (WDC).
9. The WDC(s) convene meetings to discuss the CMAP and either approve it or propose amendments to the CCC through the Village Government. The CCC reviews comments and revises the draft, then resubmits it to the WDC(s) for approval. After receiving approval from all WDC(s), the CMAP is sent to the District Council(s).

Box 4.1. Contents of a CMAP

1. A brief introduction explaining the plan
2. The geographical co-ordinates of the area to be managed and a list of the stakeholders.
3. The principles to be used in guiding management decisions (for example, that all stakeholders should participate in management activities and decisions, and that gears and fishing techniques prohibited by national legislation shall not be used in the CMA).
4. The responsibilities of each stakeholder group.
5. A brief description of how the plan was formulated, including the villages involved, meetings held, and other details.
6. A summary in matrix form of the overall purpose of the plan, expected results, indicators and assumptions.
7. The actions to be taken to achieve the desired results, such as who will do what and when it should be done, the output of these actions, and the specified assumptions.
8. Arrangements for monitoring the indicators, including frequency and the groups or individuals responsible.
9. The regulations, which include requirements that all relevant national legislation for fisheries and mangroves must be enforced, that specified reefs are closed to fishing but remain open for tourism or other non-extractive activities, and that beach sand, corals, and seaweed farms are protected.



10. The District Council(s) convene meetings to discuss the CMAP, and either approve it or propose amendments and send it back to CCC. The CCC reviews the comments and revises the draft before resubmitting it to the District Council(s). Once approved, the District Council(s) send the CMAP to the Director of Fisheries.
11. The Director of Fisheries convenes a meeting to discuss the draft and either approve it or proposes amendments which are sent back to the District Council(s). District Council(s) review the comments, revise the draft, and resubmit it to DoFi for approval, which is then announced in the Government Gazette.
12. The CMAP is integrated into the District Annual Work Plan during the annual District planning and budgeting exercise.

As with all planning activities, the individuals involved need appropriate training. For District staff, this includes training in PRA, survey methods for marine and coastal ecosystems, and socio-economic assessment methods. Possible additional training for extension workers and technical teams includes facilitation skills, micro-planning and budgeting, coastal culture, communication, awareness raising, presentation skills and conflict resolution. Available funds and human resources and capacity need to be considered whilst developing the plan.

4.2.3. CMAP review and re-negotiation

The CMAPs were initially reviewed annually, but are now reviewed on average every two years, unless a new issue arises that needs attention. In several instances the review process has led to significant changes, such as adjustments to the closed reefs. All villages within a CMA take part in the review of the plan, as well as the CCC and relevant District Officers. The steps are as follows:

1. The VMT analyses and evaluates data from the monitoring programme (fish catches, reef health and fish and other species densities).

2. The VMT presents the results to different interest groups e.g. fishers, women's groups, fish buyers, and seaweed farmers. The discussion groups are kept small (less than 20 people), but may include commercial interests such as fish and seaweed processors and tourist operators. If a group is too large it is divided into smaller groups with a common interest e.g. male fishers are often divided into smaller groups according to gear type used.
3. The discussion groups assess whether the plan is effective, using the information from the VMT, and make recommendations, for example, on any changes in strategy that are needed, or new issues to be added.
4. The recommendations of each interest group are presented at a plenary meeting chaired by the chair of the village committee and facilitated by a trained District government officer. Disagreements are resolved and, if a compromise cannot be reached, a vote is taken by secret ballot, involving stakeholders in all villages. The output of this meeting is a set of recommendations agreed by all or a majority of stakeholders.
5. The recommendations from all villages in the CMA are presented to the CCC which seeks consensus, a task that may require further negotiations with some of the villages.
6. If a new problem is identified the plan is renegotiated.
7. Agreed, reviewed plans are presented to villages, Districts, DoFi, and other stakeholders.

4.2.4. Closed reefs

A key feature of the CMAPs are the closed reefs. Villagers and District officers drew up criteria and a ranking system for closure of reefs at the beginning of the TCZCDP with technical assistance from IUCN, as follows:

- Reef condition (based on survey data): 3=good, 1=bad
- Fish species diversity: 3=high, 1=low
- Importance as a breeding/nursery area: 3=important, 1= not important
- Numbers of fishers: 3=few, 1=many
- Suitability for observation and patrolling: 3=easy, 1=difficult
- Suitability for use by village elders (e.g. whether close to shore): 3=difficult, 1=easy.

A higher ranking means most suitable for closure, and so reefs with the highest score are selected. To simplify the process, only those reefs that are known to be suitable for closure are evaluated. Village by-laws are used to enforce the closures, but closed reefs must also be approved by the government minister responsible for fisheries. At the beginning of 2006, the closed reefs covered over 30km² in total (2% of the total CMA area) and varied in size, from 1.5 to 10.0km², averaging 4km², with one or two per CMA (Table 4.5). Initially closures were planned to be for just one year, with the exception of Maziwe (see below), but all current closures have been in place for more than four years and several are now considered permanent, unless the two-yearly reviews recommend otherwise or in cases of severe famine or bad weather.

The three northernmost CMAs each have one closed reef. The closed reef for DeepSea Boma CMA (Chundo/Kirobo) was previously part of Tanga Coral Gardens Marine Reserve, which was designated in 1981 but is no longer protected. In 1987 it was important for the artisanal fishery and thought to have tourism potential but it was badly damaged by dynamite (Bensted-Smith, 1988).

Two CMAs each have two closed reefs: Mtang'ata and Boza-Sange. The closed reefs in Mtanga'ata CMA were initially Kitanga and Upangu but these were reopened after only a year. This was the result of a disagreement between the villages when the CMAP was being reviewed, combined with politics prior to local elections (see section 4.2.1.2). Catches in the CMA, as recorded by the TCZCDP monitoring programme, had shown an increase following the closure of these reefs, but appeared to fall two months after re-opening (Horrill *et al.*, 2001). As a result, in the next review of the CMAP, villagers agreed that two other reefs, further from the villages, should be closed.

When it came to designating closed reefs for Boza Sange, Maziwe Marine Reserve which was gazetted in 1975 and thus already closed to fishing, was an obvious candidate. However the Marine Reserve designation was done without consultation with the users and there was much illegal fishing. With the initiation of the TCZCDP, a large, vocal minority against the Reserve made its presence felt. The TCZCDP therefore helped stakeholders to look at the potential for distributing benefits from Marine Reserve equitably, and an MoU was drawn up between the Marine Parks and Reserves Unit (MPRU), which is responsible for Marine Reserve management, and Pangani District Council. The District Fisheries Officer was made an Honorary Ranger. The reef is large, of high conservation value with the highest number of coral genera in Tanga Region, in good condition with high live coral cover (unlike other reefs which suffered from bleaching) and has good standing stocks of fish and octopus. Its proximity to a small group of hotels makes it important for tourism development. A second closed reef (Dambwe) was established in 1997 in this CMA.



Table 4.5. Main features of the closed reefs. *Italicised reefs are those re-opened after 1 year. Length of closure is to 2005 only, as most analyses in this book run to that year. NB. Maziwe was closed in 1975 but on the ground enforcement did not start until 1998 (see Chapter 6).*

CMA	Closed reef	Area (km ²)	% total CMA	Date closed	Date opened	No. years closed	Planned length of closure
Boma-Mahandakini	Bunju	2.0	1.4	2001		4	8 yrs
DeepSea Boma	Chundo/ Kiroba	10.0	2.7	2000		5	5 yrs but reviewed every 2 yrs
Mwarongo-Sahare	Kipwani	1.5	0.8	2000		5	Reviewed every 2 yrs
Mtang'ata	Kitanga	1.0	4.7	1997	1998	1	
	Upangu	4.3		1997	1998	1	
	Makome (Kigombe)	2.5		2001		4	5 yrs but reviewed every 2 yrs
	Shenguwe	2.0		2001		4	5 yrs but reviewed every 2 yrs
Boza-Sange	Dambwe		5.5	2.5	1997	8	Permanent but reviewed at intervals
	Maziwe	4.5		1975		30	Permanent (Marine Reserve)
Mkwaja-Sange	Fungu Buyuni	3.8	0.9	2005		0	Permanent (part of Saadani National Park)

Initially Mkwaja-Sange CMA did not have a closed reef, but in 2005 the marine extension of Saadani National Park was gazetted and is a closed area by virtue of it lying within a National Park. This area, known as Fungu Buyuni, comes under the responsibility of the Tanzanian National Parks Authority (TANAPA) and a collaborative arrangement for its management has been set up.

4.2.5. Legal status of the CMAPs

4.2.5.1. CMAs and BMUs

There are no specific legal provisions for the CMAPs and their management structures but they are similar in concept to Beach Management Units (BMUs). BMUs are now being established, in accordance with Section 18 of the Fisheries Act of 2003, and are defined in Section 2 of the Act as: *'a group of devoted stakeholders in a fishing community whose main function is management, conservation and protection of fish in their locality in collaboration with the government'*.

Although both CMAs and BMUs concern collaborative management, there are a number of key differences (Table 4.6). A CMA is a geographical area, whereas a BMU is a group of people. Unlike CMAs, BMUs are based around landing sites, and these are generally associated with

single, rather than multiple, villages. In the ‘Operational Guidelines’ for BMUs in Lake Victoria (Ogwang *et al.*, 2004; Kilosa *et al.*, 2004), where some 500 BMUs have been established, the area over which a BMU operates is defined by the geographical limit of where fish are landed.

The Director of Fisheries is expected to draw up management agreements with BMUs or other local authorities according to a format that is very similar to a CMAP, as follows:

- a. Statement of objectives
- b. Description of the area covered
- c. Description of the management activities to be undertaken
- d. Rules governing the use of and access to other fishers
- e. Duration of the agreement
- f. Provision for revision of the agreement
- g. Provision for settlement of disagreement

Both BMUs and CMAs are managed through elected committees. A BMU Committee is expected to address many of the same issues as CCCs and VEMCs, including patrolling and enforcement of fishery regulations, monitoring, awareness raising and establishing closed areas, but also maintenance of a register of fishers, boats and gear, health and sanitation at landing sites, and fundraising. Although BMUs are statutory bodies, unlike CCCs, their relationship with the village government and its statutory committees has yet to be defined. The CMA and BMU approaches thus need to be harmonised. A start was made in 2004, when the Director of Fisheries, in his approval letter for the three most recent CMAPs, recommended that the CCCs should be referred to as BMUs. This means that DoFi are thinking of expanding the concept of the BMU to cover several villages.

4.2.6 CMA regulations

The CMAPs are accompanied by a set of regulations to ensure their effective implementation. Regulations for four⁷ CMAs (Boma-Mahandakini, DeepSea Boma, Mwarongo-Sahare, Mtang’ata) have been approved by DoFi and are shown in Table 4.5. They are supported by District and village by-laws (sheria ndogo); examples are shown in Table 4.7. Individuals arrested for contravening a by-law are taken before the Village Chairperson. If it is agreed that an offence has been committed, and the offender is not willing to pay the fine, the process is taken before the court and standard procedures followed. The Local Government (District Authorities) Act 1982 states that District by-laws can include prison terms in their penalties, but not village by-laws whose penalties are fines.

⁷ Regulations for Boza-Sange and Mkwaja-Sange were reportedly drawn up and submitted to DoFi but have been lost and will need to be prepared again.

Table 4.6. Comparison of CMAs and BMUs

	CMA in Tanga Region	BMU in L. Victoria (as described in operational guidelines)
Definition	A geographical area, used by a number of villages, for fishing	A group of people dependent on fishing that use the same area
Geographical scope	CMAs cover one or more Wards; boundaries are determined through a resource user survey followed by discussions between the villages and government	BMUs operate within one Ward, and there may be more than one BMU within a Ward. Locations that qualify for BMU formation are agreed through discussion with communities and government; BMUs are expected to cover an area of about 5km radius around 1 landing site
Relationship to landing sites	Each CMA includes several landing sites (and in some cases many e.g. some 20 sites in Mwarongo-Sahare CMA)	A BMU generally represents one landing site, provided that this has a minimum of 30 boats; landing sites with less than 30 boats are included in adjacent BMUs
Management approach	Co-management between stakeholders, resource users and government	Co-management between stakeholders, resource users and government
Right of access to fishery	Open access rights providing national legislation is followed (e.g. Licence); those using a CMA do not have to register with the District; but outside fishers must obtain permission from relevant villages to use a CMA and in some cases there are penalties if this is not observed	Only possible if a fisher joins a BMU; national legislation must be followed; disqualification from a BMU is possible if the member is a 'habitual criminal for fisheries malpractices' or 'of an unsound mind'; District Fisheries Officer is responsible for registration of BMU members
Institutional arrangements	Each village in a CMA elects a VeMC which is a statutory body; the elected CCC, responsible for overall management, is not a statutory committee but is a decision-making body defined through by-laws	BMUs are statutory bodies under the Fisheries Act, but are not statutory committees within a village government. A BMU Committee (c.10-20 members) is elected to manage the BMU
Fishery management plans	A CMAP is developed jointly by the villages and government; this defines the geographical area, the activities to be undertaken, penalties etc	Planning is the responsibility of the BMU Committee, but no plans have yet been produced
Legal framework	Through village and District by-laws	Through village and District by-laws (none yet in place)
Enforcement	Responsibility of existing statutory bodies; patrolling carried out as joint exercise with villages, Districts and Navy. TCZCDP has provided boats for the CMAs, the operational costs of which are covered by the Districts and villages	Responsibility of the BMU Committee, which should establish an Monitoring Control & Surveillance (MCS) Committee; each BMU should acquire a patrol boat and finance fuel to be used; MCS Committee would have powers of arrest (none have yet been established)
Financial arrangements	Financing of activities is undertaken through village and District systems	BMU Committee is expected to establish a bank account and financial management system

Table 4.7. CMA regulations, penalties and associated by-laws

CMA Regulation	Penalties	Relevant By-laws
All national legislation prohibiting certain gears and techniques must be enforced	As per national legislation	Chongoleani Village Environment By-law, 2002 Geza Village Environment By-law, 2002 Maere Village Environmental By-law, 2002 Kipumbwi Village By-law, 1996 (dynamite fishing) Ushongo village by-law, 1996 (dynamite fishing)
All national legislation relating to mangrove use must be enforced, unless amended through the CMA	As per national legislation	Kipumbwi Village By-law, 1996 Ushongo village by-law, 1996
Named reefs established as closed areas can only be used for tourism or other non-extractive activities such as research		
Removal of beach sand and gravel from the shoreline without permission from the village governments is prohibited (as per Marine Parks and Reserves legislation (1994))	Three CMAs have penalties of 10,000 Tsh; in Mwarongo-Sahare the penalty is 50,000 Tsh.	Chongoleani Village Environment By-law, 2002 Geza Village Environment By-law of 2002
Breaking or collecting corals prohibited	Three CMAs impose a fine of 50,000 Tsh, or one year imprisonment or both; Boma-Mahandakini refers to penalties under the Marine Parks and Reserves Act	Chongoleani Village Environment By-law, 2002 Geza Village Environment By-law of 2002 Kipumbwi Village By-law, 1996 Ushongo village by-law, 1996
Prohibited to destroy seaweed farms or their equipment	20,000 Tsh fine apart from Boma Mahandakini which has larger fines;	By-laws reportedly enacted but not used.
Mwarongo-Sahare and Mtang'ata CMAs only: visiting fishers must receive written permission before fishing in the CMA.		

4.3. Collaborative Mangrove Management Areas

Since 1991 all mangrove forests in Tanzania have been managed under the Mangrove Management Plan (Semesi, 1991) which encourages the involvement of local users and divides the forests into three geographical areas. Within each of these three major zones, the Plan specifies four zone types:

- Zone I- total protection vulnerable areas close to shore, comprising mainly seedlings and saplings;
- Zone II- production area with mature trees and high stand densities where mangroves are considered to be ecologically stable and have good regeneration potential; controlled harvesting of poles under licence (selective cutting) is permitted;
- Zone III- over-exploited areas, with low stand densities, that require recovery;
- Zone IV- saline areas, which can be used for aquaculture, solar salt making and other development activities.

A national Mangrove Management Project (MMP) was initiated in 1988, to support the implementation of the plan. This started fully in 1994 and was thus active in Tanga Region, which comprise the Northern Zone under the national plan, when the TCZCDP started. An MOU between the TCZCDP and MMP was drawn up in 1997 to facilitate the smooth running of mangrove activities and to avoid creating parallel structures, as the two programmes were working in the same areas, with the same people and same resources. In 2002 when the Programme decentralised to Districts, similar MOUs were prepared between the Districts and the MMP.

The TCZCDP supported the MMP in activities such as monitoring and rehabilitation (Chapter 6) but also decided to extend its experiences with CMAPs to mangroves. Three of the CMAPs (DeepSea Boma, Boza Sange and Mkwaja-Sange) have Results relating to mangroves (Table 7.4), but two specific collaborative mangrove management plans were also prepared.

KiSa Forest: This 422 ha forest lies along the coast and estuary of Msangazi River in Pangani District, near Kipumbwi, which was a pilot village for both the TCZCDP and the MMP; it lies within Boza Sange CMA. In 1994, a Mangrove Committee was set up with the help of MMP. A mangrove resource use assessment was carried out, and the boundaries and user right status agreed. Following consultations, Kipumbwi village agreed in December 1996 that Sange village should participate in the plan as the villagers used the southern section of the mangrove forest. Sange set up its own village committee, the Lands and Environment committee. In January 1997, the KiSa plan was developed to show how the two villages could share management responsibilities. As in the CMAs, a co-ordinating committee with representatives from both villages was established. With IUCN assistance, this drew up agreements to ensure that the villages would share rights as primary users and equally divide potential financial revenues. The plan also describes the 'silvicultural regime' and arrangements for management.

Chongoleani Forest: This 551 ha forest is adjacent to the villages of Chongoleani and Ndaoya in Chongoleani Ward, Chumbageni Division, Tanga City, and is bounded by the river Ngole to the north, Ndaoya village to the south, and Chongoleani village to the west; it is within Mwarongo-Sahare CMA. The management plan was prepared in 2003 and replicates the structure of the KiSa Plan. The partners involved are the villages, Tanga Municipal Council and the national Forestry and Beekeeping Division, on behalf of the MMP. Each village is responsible for managing different areas of the forest. The representative body of Chongoleani is the Natural Resources Committee as a sub committee of the village government. The Management Objective

is: *Protection and sustainable utilisation of the mangroves for the benefit of Chongoleani residents.* All management blocks have a protected buffer strip of 15 m from the edge of any stream in order to protect stream banks from erosion. Surveys undertaken in 2002 as part of the formulation of the plan showed that many areas designated as Zone III were recovering. This plan also involves replanting mangroves and installing beehives (Chapters 6 and 7).



4.3.1. Process for preparing collaborative mangrove management plans

As with the CMAPs for marine resources, mangrove management plans specify the roles, rights and responsibilities of the collaborating partners. The process was based on that used for CMAPs, with a village plan being developed first for Kipumbwi, and then consulting with Sange. The preparation of a collaborative mangrove management plan can thus be summarised as follows:

- Survey the area (PRAs)
- Participatory mapping
- Resource use assessment
- Establish and involve responsible institutions (e.g. District, VEMC)
- Prepare the plan (participatory)
- Approve plan at village level
- Approve plan at Ward level
- Approve plan at District level
- Approve plan at National level; zonal mangrove officers may now approve mangrove plans rather than the Director of Forestry.

The village government must cooperate with the forest users and government authorities in the implementation of the plan. It approves the by-laws, calls general meetings or village assemblies for feedback on request, and keeps records of correspondence and activities regarding the plan and use of money accrued from forest operations, that will be presented to the forest users and other government authorities on a quarterly basis and on request.

4.3.2. Legal status

Legislation relating to mangroves, as with fisheries, was revised over the course of the TCZCDP. In the 1950s, extraction of any products from mangroves was prohibited. The Exemption of Forest Reserves Notice of 1961 made allowances for villagers to cut, remove and possess mangrove forest produce for domestic use under certain conditions and limitations. The 1998 Forestry Act required that all mangroves (including individual trees) be gazetted as Forest Reserves, and the zones laid out in the Mangrove Management Plan were given a legal basis. The Act stipulated licensing criteria and fee schedules for extractive use: small-scale use of non-timber mangrove products is allowed under permits issued by the District Forest or Mangrove

Officer. The Forestry Act (2002) laid out further amendments and specifically provides for the joint management of mangroves by local communities and the Mangrove Management Unit of the Forest and Beekeeping Division. It allows communities living adjacent to forests to benefit provided they have developed a Management Plan or Agreement, and thus gives strong support for the collaborative mangrove management plans set in place by the TCZCDP and MMP.

Forest users have exclusive rights to the products from harvesting and silvi-culture, and from development activities, but mangrove forests remain the property of Central government. District and/or Central government personnel are permitted to investigate the activities of forest users or the Natural Resources committee in order to determine whether a management plan is being implemented satisfactorily. The collaborative mangrove management plans define areas for different uses (e.g. collection of firewood and building poles for both domestic and commercial use, boat building, eco-tourism, beekeeping, medicinal plant collection, and salt boiling). Harvesting is supervised by the MMP and VEMCs. Any person who cuts, or debarks a tree, uproots, or destroys planted seedlings, removes or alters any beacon, signpost or mark, destroys any honey receptacle, hives, or fishes illegally without authority/license of the committee can be charged according to relevant village by-laws. Mangroves are patrolled at high tide by boat when access is easier as part of the village patrols.

A revenue sharing scheme is allowed for under the Forest Regulations but has not yet come into force. The 'KiSa plan' thus includes a revenue sharing scheme but this is not yet in operation. The villages are expected to keep separate accounts for funds collected as a result of the management plan. 40% of any funds are retained for use in the management of the mangrove forest, and the remaining 60% can be used for general development activities. All expenditures have to be approved by the village assembly on the basis of an agreed budget. The revenues generated from mangroves are currently low, with little potential for financing management. Measures aimed at raising further revenue are likely to lead to the issuing of more permits for mangrove harvesting, which at the moment is in contradiction with conservation measures. The national MMP is oriented very much at the national level, which makes it difficult to access funding for local initiatives. A retention scheme, involving 10-15% of mangrove revenues to be returned to the District treasurer, has been recommended (Jambiya, 2002).

4.4. District and other spatial plans

4.4.1. District ICM Plans

Under the National Integrated Coastal Environment Management Strategy (2003), Districts are expected to produce District ICM Action Plans. Pilot plans have been produced in three Districts with the support of TCMP, one of which is Pangani. The Pangani ICM plan was drawn up in 2000 by a Pangani District Working Group with technical assistance from TCMP and was adopted by Pangani District Council in August 2001. Its preparation took careful consideration of the two CMAPs that are in place in the District.

The District planning process is based on the draft TCMP local ICM Action Planning Guidelines (TCMP, 2002) and is similar to TCZCDP village action planning. The first step was to identify the issues (at District level), of which there were 23, and then to prioritise these. The top priorities were considered to be low fish catches, destruction of mangroves, increasing beach pollution from human excreta and coconut husks, and excavation of stones along the Boza escarpment, German graves and other historical sites. Since the first two issues were being

addressed by TCZCDP and MMP respectively, it was decided that the ICM plan should address only the latter two issues. Five of the 11 Pangani villages are involved (Boza, Pangani E., Pangani W., Bweni and Ushongo). Beach pollution had previously been identified as an important issue under the TCZCDP but had only been addressed during Phase I⁸.

4.4.2. Marine Protected Areas (MPAs)

The CMAs include two types of protected areas: Marine Reserves (Maziwe), and National Parks (Saadani). The former are gazetted under the Marine Parks and Reserves Act (No 29 of 1994) which allows for the designation of Marine Parks (large multiple use MPAs) and Marine Reserves (small MPAs in which extraction of any marine resource is prohibited). Marine Parks and Marine Reserves are the responsibility of the MPRU, which has a collaborative agreement with Pangani District for the management of Maziwe Marine Reserve (section 4.1.4). National Parks (within which exploitation is prohibited) are gazetted under the Wildlife Conservation Act of 1974, and are managed by the Tanzania National Parks Authority (TANAPA). Saadani National Park (straddling Bagamoyo and Pangani Districts) is the first National Park to include marine habitat (see section 4.1.4.).

A few small areas of mangrove are protected as 'traditional sanctuaries' or *mzimu*. Two such sanctuaries occur near Kipumbwi (Kitoipi and Kwakibibi) and are used for spiritual worship. Three elders in Kipumbwi Mtoni are responsible for their protection and no one may enter an area without their consent. If people come to worship and succeed with their prayers they leave a small offering (e.g. a pair of kangas) (Nurse and Kabamba, 2000). There may be other such sanctuaries in the Districts.

As mentioned earlier, plans are being made for the establishment of a Coelacanth Conservation Area, the legal status of which will have to be determined.

4.5. Conclusions and lessons learnt

The development of a system for preparing CMAPs and collaborative mangrove management areas, using a process that is generally satisfactory to both communities and the government, has been one of the main achievements of the TCZCDP. Key aspects of this process are the consultation both within and between villages, and the technique of 'action planning', where problems, causes, and solutions are clearly identified both of which are factors that reduce conflict between users, a common obstacle to successful coastal zone management.

4.5.1. CMAs

A key characteristic of the CMAs and the collaborative mangrove management areas is that their extent is defined according to resource use, rather than according to political or administrative boundaries. Although this made the establishment of management and organisational structure more complex, the approach seems to have been well understood by both fishers and the Districts. When the Phase III final evaluation recommended that the CMA boundaries should be meshed with the District boundaries to give them greater official status, there was disagreement by the stakeholders on the grounds that this would not reflect the

⁸ During Phase I, using local knowledge and experts, villagers dug garbage pits and constructed pit latrines (using coconut husks to strengthen the side walls) in some of the Pangani villages. Many latrines were destroyed by the heavy El Nino rains in 1997/8, which discouraged the villagers. The need to reduce the number of issues being addressed meant that beach pollution was subsequently dropped from the TCZCDP.

resource-use basis of the CMAs; the DEDs themselves said that this should be achieved through legislation or formal endorsement. The recent changes in District boundaries (the establishment of Mkinga as a District, and the inclusion of part of Muheza in Pangani) have illustrated an additional benefit to having the CMAs based on resource use; although changes will need to be made to the management structure, the CMAs themselves will remain with their previous boundaries.

Village action plans were the fundamental building blocks of the TCZCDP, ensuring that the needs of local people are addressed, their knowledge and understanding of how to solve problems used, and that a sense of ownership of the plans by the villagers was developed. The process used to develop collaborative plans evolved through “adaptive management” moving from pilot villages to the current situation where all users are involved, as described above. Established initiation and review procedures including the feedback of monitoring information into management decisions provides a clear illustration of the use of an adaptive management approach. Although there are other stakeholders in each CMA such as fish and octopus processors, seaweed farming companies, tourist operators to date these have been very peripherally involved in the development and review of the CMAPs. Capacity was built at local level for identifying problems and finding solutions.

4.5.2. Closed reefs

The fact that reef closures are included in all the CMAs, that these are being established for increasingly long periods, some permanently, and that most communities see them as an acceptable management tool, is another major achievement. There is substantial scientific evidence that permanent reef closures are a vital tool in the suite of measures required to manage coral reef fish populations sustainably, due to their life history strategies, among other reasons (Gell and Roberts 2003, Halpern 2003, Russ 2004, McClanahan and Graham 2005), but this is not always easy for communities to understand. Scheinman and Mabrook (1996) found that communities in Tanga were already familiar with the concept of closed reefs, having heard of the Marine Parks in Kenya that are closed to fishing. This may explain why reef closures were fairly readily adopted in the CMAPs compared with Mafia Island Marine Park and Mnazi Bay-Ruvuma Estuary Marine Park where no-take zones have, or are being, introduced, and Mnemba Island Conservation Area in Zanzibar which is a closed area, and where there has been opposition in the past (Wells and Samoilys, personal observations).

In Boza-Sange the potential benefits from tourism such as direct employment or increased opportunity to provide services may have contributed to acceptance of closed areas since this CMA has the greatest number of hotels and also is the location for Maziwe Marine Reserve which is used by snorkellers and divers. However, in areas where there is limited scope for tourism, fishers may be seeing other benefits such as replenishment of fish stocks (see Chapter 5). This could also explain the longer reef closures, as villagers have learnt that the benefits of the one-year closure of Kitanga and Upangu Reefs lasted only for a brief period, and fish stocks rapidly reverted to their previous low levels when the reefs were opened (see Chapter 6).

Although sound criteria were developed for choosing the reefs for closure, relatively little attention was paid to the overall design of the system, largely because scientific thinking on this topic was still relatively equivocal, and also because the Programme lacked the detailed data that is required to set up a scientifically designed system. The theory of marine reserve networks is now well developed, principles defined (e.g. connectivity, resilience, replication, and representativeness) and criteria for site selection have been developed (e.g. Roberts *et al.*, 2003).

In the future, it would be worthwhile to review the Tanga closed reefs in relation to such criteria, in order to see if adjustments are necessary. In the meantime, the existing closed areas if enforced, provide the central element of the broader coastal management programme, and their acceptance by Tanga fishers has led to communities elsewhere in Tanzania (e.g. Rufiji) expressing an interest in establishing them, providing they have control over them as is the case in Tanga (WWF Tanzania, pers.com).

4.5.3. Legal status of planning arrangements

The lack of a legal framework for the CMAPs has been a cause for concern. The expansion of the concept of the BMU, from single landing sites to several villages, will help to harmonise the two fisheries planning approaches and promote a more ecosystem-based approach to management, focusing on areas of resource distribution and use, rather than administrative boundaries.

The CMAPs require standardisation of format and content, as requested by DoFi and recommended by the Phase III evaluation. The names of the CMAPs should be standardised (currently there are 'Reef Fisheries Action Plans' for Mtang'ata, Mkwaja-Sange and Boza-Sange, a 'coastal resources management plan' for Mwarongo-Sahare, a 'Fisheries and Mangrove Area Management Plan' for DeepSea Boma, and a 'Management Plan' for Boma-Mahandakini).

The TCZCDP was planning a review of the by-laws in Phase IV and there continues to be an urgent need for their revision and harmonisation, as recommended by Shauri (2003a) and requested by the Director of Fisheries in a letter in 2004. Some appear to be technically wrong (e.g. one by-law in relation to mesh size), and others set lower penalties than stipulated in the fisheries regulations (e.g. Geza Village Environmental Conservation By-laws, 2002), even though it was emphasised to the villages that by-laws should not go beyond national legislation. At the same time, all CMAPs should include regulations and penalties that are sufficiently strong to act as a deterrent.

Most of the by-laws consist of a list of prohibitions with penalties such as fines and imprisonment and do not adequately explain the process of developing the plans, the roles, rights and responsibilities of different players, how closed reefs should be managed, how licences and permits can be obtained for access and use of coastal resources, and how the various committees operate. For example, although the Chongoleani Village Environmental By-laws, 2002, define the term "member of the environmental committee", they do not define the VEMC itself, nor its structure and responsibilities. A better model is the (draft) Mafuriko Village Conservation, Development and Sustainable Use of Mangrove Resources, Bylaws in which the structure, roles and responsibilities of the Village Natural Resources/Mangrove Committee are well defined. The by-laws must clearly stipulate the participatory procedure for the formulation and adoption of the CMAPs and collaborative mangrove management plans. They could also include community service as a penalty, which would make it possible for the labour of the offenders to be expended in rehabilitating any destroyed marine habitat (Shauri, 2003a).

4.5.4. Integration with other planning processes

The TCZCDP was originally planned to address *integrated coastal management*, but the CMAPs (primarily addressing fisheries) and the collaborative MMPs are essentially sectoral. Given the lack of capacity in the Districts, this in retrospect was probably a better approach. Even the Pangani District ICM plan, prepared with the support of TCMP, does not fully reflect an

integrated approach, as it addresses relatively few issues. Achieving a fully integrated planning and implementation process for the coastal zone has proved challenging in most countries (e.g. South Africa Glavovic, 2006). Nevertheless it is an important goal, and further thought perhaps needs to be given in Tanga Region to the harmonisation of the various sectoral plans and to the processes involved in mainstreaming this into the District Development Plans. This is discussed further in Chapter 10.



Table 4.3: Objectives and Results of each CMAP

	BOMA MAHANDAKINI	DEEPSEA BOMA	MWARONGO-SAHARE	MTANG'ATA	BOZA SANGE	MKWAJA-SANGE
Objective	Increase income through increase of coastal resources (fish, mangroves and seaweed) and sustainable use of the CMA	Increase coastal natural resources and its products and sustainable use in Deep Sea-Boma management area	Increase income for residents of the 12 villages through increased production of fish and seaweed	Increase income of fishers in Mtang'ata through increased catch, seaweed production, and reliable fish market	Increase income of the residents of the villages through increased fish catch	Increase income of the residents of Sange, Mikocheni and Mkwaja villages through increased and sustainable use of coastal resources
Result 1	Reduced illegal practices and use of coastal resources	Reduced illegal use of coastal natural resources	Reduced incidences of illegal uses of coastal resources	Destructive resource use reduced	Reduced illegal fishing	Seaweed production increased
Result 2	Increased fish	Increased fish, prawns and crabs	Reduced number of visiting fishers	Fishing pressure reduced by decreased number of visiting fishers	Reduced legal but destructive fishing activities	Increased fish catch
Result 3	Increased seaweed production	Reduced user conflicts	Seaweed production increased	Reduced number of legal but destructive fishing	High fishing pressure reduced by decreasing fishers an/or vessels	High fishing pressure reduced by decreasing fishers/ vessels
Result 4	Decrease of fishers? in one area (overfishing)	Reduced legal but destructive fishing techniques	Increased fish stocks	Increase seaweed production	Water pollution from sisal wastes, human excreta and coconut husks reduced	Illegal cutting of mangroves reduced
Result 5		Increased seaweed production	No conflicts between fishers and seaweed growers that result in loss of seaweed production	Fish stocks increased	Illegal cutting of mangroves reduced	Increased protection of turtles
Result 6		Increased mangrove forest		Reliable market for fish	Increased protection of turtles	
Result 7				Guidelines for selling coastal areas		
Result 8				Conflicts between users reduced		

Table 4.4: Comparison of results from each CMAP

	BOMA MAHANDAKINI	DEESEA BOMA	MWARONGO-SAHARE	MTANG'ATA	BOZA SANGE	MKWAJA-SANGE
Result	Increase of coastal resources (fish, mangroves and seaweed) and sustainable use of the CMA	Increase of coastal resources and its products and sustainable use in Deep Sea Boma management area	Increase of coastal resources and its products and sustainable use in Deep Sea Boma management area	Increase of coastal resources and its products and sustainable use in Deep Sea Boma management area	Increase of coastal resources and its products and sustainable use in Deep Sea Boma management area	Increase of coastal resources and its products and sustainable use in Deep Sea Boma management area
Reduced illegal practices and use of coastal resources	Yes	Yes	Yes	Destructive resource use reduced	Yes	—
Increased fish, prawns and crabs	Yes	Yes	Yes	Yes	—	Yes
Reduced legal but destructive forms of fishing	—	Yes	—	Yes	Yes	—
Reduced fishing effort (both fishers and vessels)	—	—	—	—	Yes	Yes
Reduced number of visiting fishers	Decrease of fishers in one area	—	Yes	Yes	—	—
Increased seaweed production	Yes	Yes	Yes	Yes	—	—
Reduction in user conflict	—	Yes	Yes (between fishers & seaweed growers specifically)	Yes	—	—
Illegal cutting of mangroves reduced or increased mangroves	—	Yes (increased mangrove forest)	—	—	Yes (illegal cutting reduced)	Yes (illegal cutting reduced)
Increased protection of turtles	—	—	—	—	Yes	Yes
Other	—	—	—	Reliable market for fish Guidelines for selling coastal areas	Water pollution from sisal wastes, human excreta and coconut husks reduced	—

Table 4.5: REGULATIONS in each CMAP

	BOMA MAHANDAKINI	DEEPEA BOMA	MWARONGO-SAHARE	MTANGATA	BOZA SANGE	MKWAJA-SANGE
General regulations						
Visiting fishers should first receive written permission before fishing in the CMA	N/A	N/A	20,000 Tsh fine	20,000 Tsh fine		
All fishing gears and techniques prohibited under national legislation are prohibited	As per relevant fisheries regulations	As per relevant fisheries regulations	As per relevant fisheries regulations	As per relevant fisheries regulations		
All uses of mangroves regulated as under the national forestry legislation, unless amended by a collaborative management plan agreed by the users	As per forestry regulations	As per forestry regulations	As per forestry regulations	As per forestry regulations		
Collection of sand or gravel along the shoreline prohibited without written permission from Village governments in the CMA	10,000 Tsh fine	10,000 Tsh fine	50,000 Tsh fine	10,000 Tsh fine		
Specific regulations						
Named reefs only to be used for tourism (or training/research) prohibited to collect anything live there	Bunju 100,000 Tsh fine or one year imprisonment or both; confiscate gear, vessel & fish	Chundo-Kiroba 20,000 Tsh fine or one year imprisonment or both	Kipwani, Shenguwe 20,000 Tsh fine or one year imprisonment or both	Makome, Shengue 20,000 Tsh fine or one year imprisonment or both		
Prohibited to break or collect corals (in closed reefs or anywhere in the CMA?)	As described in Marine Parks and Reserves Act of 1994	50,000 Tsh fine or one year imprisonment or both	50,000 Tsh fine or one year imprisonment or both	50,000 Tsh fine or one year imprisonment or both		
Prohibited to destroy seaweed farms or their equipment	50,000 Tsh fine or one year imprisonment or both	20,000 Tsh fine	20,000 Tsh fine	20,000 Tsh fine		
Unlawful not to perform environment activities	N/A	1,000 Tsh fine	N/A	N/A		
Unlawful not to implement the management plan	As described by village bye-laws	N/A	N/A	N/A		

CHAPTER 5: FISHERIES AND THEIR MANAGEMENT IN TANGA REGION

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5.1 Introduction

At the time the TCZCDP was formulated, there was scant interest in the fisheries in the Region, apart from an early study by Watten and Matemba (1982). In 1994, government priorities were to increase fish production and revenue, and there was little attempt to implement fishery management. In 1997, with the introduction of the Local Government Reform Programme (LGRP), a formal national Fisheries Sector Policy and Strategy Statement was prepared which recognised the need for long-term strategies to sustain fisheries and ecosystems and provided a framework for local authorities to operate under the LGRP. This greatly improved the policy context for the work of the TCZCDP, for which a key objective was to reverse the reported trends of declining catches and smaller-size fish. The main interventions to achieve this were eliminating destructive fishing, reducing fishing effort and establishing areas closed to fishing.

This chapter describes the fisheries in Tanga Region, the monitoring programme designed by the TCZCDP for the artisanal fishery, enforcement activities, and the efforts to halt illegal fishing. The TCZCDP focused on the fin-fishery and did not collect detailed information or directly address invertebrate fisheries. However, there is much overlap between finfish and invertebrate fisheries, with many fishers harvesting a wide range of species, and the reef closures can be expected to have affected invertebrate species associated with coral reefs, as described in Chapter 6.

5.2. Tanga Region Fisheries

There are four main categories of fisheries: the artisanal fishery, products caught artisanally but destined for the commercial sea food processors and exporters, the commercial prawn fishery, and a small sport and game fishery. Fishery resources in Tanga Region include fish, octopus, sea cucumbers, spiny lobsters, shells (for both food and curios), corals (previously collected for building, lime production and curios although rarely now) (Gorman, 1995) and prawns.

5.2.1. Artisanal fishery

Artisanal fishing is one of the main livelihood activities in Tanga Region with up to 80% of the adult male population involved in some villages such as Moa, Kwale and Ushongo, although this drops to 25-30% in the semi-urban areas of Tanga City (Gorman 1995, Beckley *et al.*, 1997). Men do most of the fishing although some women fish in shallow water for prawns (*uduvi*), and a larger number process fish and collect octopus and molluscs at low tide. The fishery is multi-gear and multi-species, as seen in many tropical parts of the world (Munro and Williams 1985, Munro 1996, Wright and Hill 1993).

During the southeast monsoon (April-October), which has stronger winds and rough seas, fishing activities are confined to inshore waters but, in the calmer period of the northeast monsoon (November-March), boats fish further offshore. Distances travelled are limited by the lack of ice and storage facilities and by the size of the fishing vessels. Catches are landed at about 50 government-designated landing sites, although other sites are also used to evade payment of the local fisheries tax. This is the main fishery in terms of numbers of people involved and was the focus of the TCZCDP; it is described in detail in the remainder of this chapter.

5.2.2. Commercial seafood processors and exporters

Rosenstiel (1977) had concluded that there was little potential for trawling or other modern commercial fishing methods. However, commercial interest in the area is growing rapidly in the form of seafood processors and exporters who buy product from artisanal fishers for export or distribution elsewhere in the country. There are currently three in Tanga Region. Sea Products Limited (SPL) is the principal one and has been in operation since 1993, supplying the overseas market only. Its exports have grown considerably since 2003 when the business expanded, and product is now obtained not only from Tanga Region but also from other parts of Tanzania, including Pemba. Tanpesca started in 2002, and Bahari Food Ltd in 2006. Prawns, octopus, lobster, fish, sea-cucumbers and shells are bought for redistribution, including export, year round. The presence of a buyer can change fishing patterns by providing a ready market for particular species, resulting in some fishers changing target species (e.g. finfish to lobster). Products are bought through middlemen.

During the first three Phases of the TCZCDP, export of finfish was banned (at times there was illegal export to Kenya) and the focus was on invertebrates. The ban is now being reconsidered, and in 2004 the Government offered a limited number of finfish export licences on a trial-basis. SPL is now exporting finfish as part of this trial (Allard *in litt.*, 2005). This company probably provides a significant income to fishers, and has a commitment to sustainable fishing practices; it participates actively in the TCCF.

While not consumed locally, at least 20 species of sea cucumber are collected in Tanzania, dried and exported to South-East Asia where they are considered a delicacy. Small commercial operators run the fishery, employing artisanal fishers. In 1995 the catch for the whole of Tanzania was 1,460 mt and Tanga was one of three main exporting ports (with Dar es Salaam and Zanzibar). There is also said to be a significant unregulated trade over the border to Mombasa in Kenya (Marshall *et al.*, 2001).

It is not known how much octopus is taken annually in Tanga Region but it is thought to be considerable since both SPL and Tanpesca buy up large quantities for export (Allard *in litt.*, 2005). An estimated 600 tonnes are taken each year in Tanzania. This fishery was traditionally dominated by women and children but the growing demand and higher prices has led to an increasing number of men taking part, including fishers who are taken out in the exporters boats and paid premium prices (Guard and Mgaya, 2000).

Mainland Tanzania does not record lobster in the national fisheries statistics, but it is known that Tanga was the most important production area in the late 1990s, and has recently been overtaken by Kilwa and other areas. Some are taken for the local market, but they are also frozen for export (SPL exports slipper lobsters and crabs (Allard, *in litt.*, 2005)), and some may go directly over the border to Mombasa, Kenya. Total mainland exports in 1997 were 34 mt (Marshall *et al.*, 2001).

5.2.3. Commercial prawn fishery

In Tanzania, the prawn fishery is primarily oriented to exports and is a major source of foreign exchange. The companies involved are joint ventures between Tanzanian and foreign companies and local communities are not involved. The trawlers are licensed by the Division of Fisheries (DoFi) and the catch is handled through the companies' own storage and processing facilities. There are three zones, and Tanga Region lies in Zone 1, the season runs from April to November.

At the start of the TCZCDP, patrol units and villages complained of trawlers fishing inside the reef system and identified this as one of the main issues of concern. Most trawling takes place at depths of 4-10m, but the small mesh nets drag along the bottom and destroy bottom living communities; there is also considerable by-catch. The 1970 Fisheries Act did not cover prawn trawling and there are no regulations specifically for this fishery. Following the advice of the DoFi, village by-laws were formulated to prevent trawlers fishing in the CMAs. Copies of these by-laws and the areas to which they apply were sent to the DoFi and incorporated in the trawling licence conditions (Horrill *et al.*, 2001), along with other requirements including that DoFi observers should be present on the boats and a minimum trawl depth of 3 m. Since then only one encroachment had been reported.

5.2.4 Sport fishing

A small sport and game fishery is based at the Tanga Yacht Club (TYC) and some of the resorts and hotels in the Region. The focus is on large pelagics such as marlin, tuna, sailfish, and wahoo that are generally caught outside the CMAs, using trolls with 15-80 pound lines and bait such as repalas, lures, and half beaks (*chuchungis*). Sport fishing through the TYC has declined noticeably in recent years, said to be due to the lower number of sport/game fishers. The TYC records (1978-2002) show a dramatic decrease in the catches of bill fish. The last marlin was caught in 1995, while several sailfish were caught annually before 2000 and only three since 2000. In contrast, catches of smaller game fish, such as bonito, dolphin fish (*felusi*), spanish mackerel (locally called king fish), and rainbow runner are increasing.

5.3. Description of the artisanal fishery

Statistics on fishers, vessels and gear are based on registration, usually once a year and, as in many countries, the figures for Tanzania are not fully reliable. The presence of migrant fishers also contributes to inaccuracy. The DoFi carries out frame surveys approximately every three years, providing information on fisher, boat and gear numbers among other parameters. Given the lack of other information, we use government figures here as our best estimates, unless otherwise stated.

5.3.1. Fishers

The government statistics indicate that licensed fishers more than doubled in number between 1970 and 1993, from 1,874 to 4,485 (Beckley *et al.*, 1997). A dip in 1985 was thought to be due to a three month ban that was imposed on Zanzibar fishers using the mainland (Bensted-Smith, 1988). The overall increase may be due to several factors including:

- The decline of the sisal trade in the 1970s/1980s that may have pushed former plantation employees into fishing;

- The increase in labour-intensive fisheries techniques (Bensted-Smith, 1988), notably beach-based fishing, beach-seine nets, and purse-seining for *dagaa* (see below);
- Increasing unemployment among young people in the villages (Bensted-Smith, 1988).

Fisher numbers, according to frame survey data (Table 5.1), stayed relatively constant at about 4300⁹ over the period 1995-2001, and are presumed to have remained stable since then. There are large differences in numbers between Districts, with most fishers in Muheza (1578 in 1999), fewer in Tanga (1371 in 1999), and fewer still in Pangani (301 in 1999). However, Tanga City, with a short coastline but large population, has the greatest density of fishers per km of coastline (16 per km) (Horrill 1999).

Traditionally and now, fishers had access to all fishing areas, although they tended to use their closest fishing grounds (see 5.2.4. below, Scheinman and Mabrook, 1996). There is much movement up and down the coast, with fishers also coming from Zanzibar (both Unguja and Pemba), and distant parts of the mainland coast. Some migrant fishers come for a period of time and build temporary fishing camps at certain spots, staying up to 2-3 months at a time in a good location. This movement sometimes reflects seasonal variations in productivity of fishing grounds, but is also a 'style of life' in that fishers are able to save money by living away from home (Bensted-Smith, 1988; Scheinman and Mabrook, 1996). Migrant fishers can thus have a large impact on fisher numbers in an area at any one time. Traditionally they introduce themselves to the village chairman and fisheries officer, and may be asked to produce their fishing licences. More recently, with the greater pressure on resources, villagers have required that they actively seek permission before fishing, and for most of the CMAs this is now a specific requirement.

Table 5.1 Numbers of landing sites, fishers and vessels in Tanga Region (sources: 1991-1993 = Beckley et al, 1997, but note that fisher numbers are identical each year and thus probably there is a data error; 1995-2001 = National Fisheries frame survey data; 2006 = District reports)

Year	No. of landing Sites	No. of Fishers	Vessel Categories					Total vessels
			Ngalawa	Mtumbwi	Mashua	Dau	Boti	
1991		4,485						947
1992		4,485						698
1993		4,485						698
1995	48	4,202	394	261	150	50	41	896
1998	46	4,380	452	262	84	137	34	969
2001	52	4,361*	502	237	100	84	21	944
2006	N/A	4,443	N/A	N/A	N/A	N/A	N/A	N/A

* Includes those recorded as 'owners'.

⁹ Horrill (1999) gives a lower total number of fishers (3252) - c. 1000 less than the frame survey data but this was based on an independent survey by the TCZCDP for other purposes and may not have covered all areas.

5.3.2. Vessels

Vessel numbers, like fisher numbers, have remained relatively constant since the early 1990s, at around 900 (Table 5.1). Most fishing vessels are small and sail-powered and are operated by their owners; the following are the most common (information from TCZCDP; Bryceson, 1994; additional information available in Watten and Matemba, 1982):

- *Ngalawa*: wooden dug-out canoes up to 3-6.5m long, with two out-riggers, mast and sail; the most commonly used vessel; numbers have increased from just under 400 in 1995 to over 500.
- *Mtumbwi*: very simple dug-out canoe, 2-4.5m, used with poles, paddles or small sail; the second most commonly used vessel; there are about 240.
- *Dau*: dhow, wooden planked boat with pointed stern and prow, 3-6m long, usually with a sail; numbers variable.
- *Mashua*: large, wooden planked boat with flat transom (stern) and sail; 6-12m long; numbers variable.
- *Boti*: fibreglass with straight stern, 3-10m long; usually has an engine; 20-40 in total.

The relatively constant number of fishers and vessels from 1995 to 2001 suggests that fishing effort has remained fairly steady despite human population increases which is encouraging and has made it easier to analyse changes in catch rates.

5.3.3. Gears

A wide variety of gears are used (Bensted-Smith, 1988; Anderson, 2004), and the 1995 socio-economic survey found major differences between the nine villages studied in the gears used (Gorman 1995). The main gears are handlines and fish traps, followed by gill nets and shark nets (Table 5.2). The first two are traditional, whereas gill nets and shark nets were introduced, *Nyavu* in the 1960s and *jarife* and *sinia* by 1982. Gill nets were also made available at subsidised prices through a NORAD funded fisheries development programme in 1985/86 (Bensted-Smith, 1988; Horrill *in litt.* May 2005).

Table 5.2 - Numbers of different fishing gears used in Tanga Region 1995, 1998, 2001
(source: National Fisheries frame survey data)

	1995	1998	2001
<i>Mishipi</i> hand-line	2,898	2,654	1,883
<i>Madema</i> fish trap	1,294	1,258	2,162
<i>Nyavu</i> gill-net	1,182	631	953
<i>Jarife</i> shark net	814	608	404
<i>Ringi</i> ring net/purse seine	79	128	102
<i>Senga</i> scoop nets	66	255	106
<i>Juya</i> beach seine	57	84	0
<i>Kaputi/dhulumati</i> long-line	38	34	56 ^a

^a The government frame survey reports 788 longlines for 2001 but this is an error data recorders mixed 'number of hooks per line' with 'number of lines'. When recalculated from the raw data the actual figures are 33 in Muheza, 23 in Pangani and 0 in Tanga.

Mishipi (handlines): the main gear, largely because it is inexpensive. It is used from *ngalawa* and *mtumbwi* particularly for reef fish, especially carnivorous groupers, snappers and emperors; according to fishers from Kwale (Gorman, 1995) the fish taste better caught with *mishipi* as they are not dragged over the bottom or crushed as in a net. Table 5.2. indicates that handlines decreased in number between 1995 and 2001, although they are considered relatively environmentally sound as they do not damage the habitat and they target the species desired and thus have minimal by-catch.

Madema (fish traps): the second most common gear, used from *ngalawa* and *mtumbwi*. Traps are usually placed in sea grass areas and near reef edges on sand. They tend to capture herbivores such as parrot fish, surgeon fish, rabbitfish, and other species (Anderson, 2004). Trap numbers have doubled since 1998, to over 2000 in 2001 (Table 5.2).



Jarife and sinia (shark nets) and Nyavu (gill-nets): These are both gill-nets and can be set either at the surface, mid-water or on the bottom, or, less commonly, are used drifting. They are used from *ngalawa* and *mitumbwi* but can also be deployed from *mashua* and *dau*. They are often used in deeper water to catch larger fish, and are used less for reef fish. The different types of gill net are defined principally by mesh size:

- *Nyavu* (5-10cm), mono-filament nets, deployed at the surface (e.g. for mullet), mid water or on the bottom (e.g. for sole). *Nyavu* are set stretched, so that fish are caught by their gills as they try to pass through; they are often reported as the number of 'units' several units may be attached together to form one net. Numbers of *nyavu* nearly halved in 1998, but then increased in 2001 (Table 5.2)
- *Jarife* (12-20cm), deployed at the surface, *Jarife* declined in number during the programme, with half as many in 2001 as in 1995 (Table 5.2).
- *Sinia* - (20-30cm), are usually bottom set to catch rays and skates, and are not recorded in frame surveys.

Both *jarife* and *sinia* are hung loosely and catch fish through entanglement (the term 'entanglement nets' was used for both these gears by the TCZCDP in Phases I and II of the programme).

Gill nets are often considered as non-destructive gears and were used in the TCZCDP gear exchange programme (see below, section 5.7). However, they also have their problems because, like other nets, they may catch turtles, particularly the larger mesh *jarife* and *sinia*. Gillnets set on the bottom can cause damage to substratum, and when small size mesh is used they target juveniles. They are also used for sharks, an increasing concern in the WIO.

Ringi (ring nets or purse seines): These are deployed in open water, commonly on larger commercial boats (*mashua*, *madau*) and at night with lights. A ring net is usually a single net

(unlike gill nets made from a number of units), and is expensive and thus restricted to wealthier fishers. Commercial operations require crews of 10-20 and in 1995 were common only in the Sahare/Mnyanjani area (Gorman 1995). Numbers of ring nets in use in Tanga Region seem to fluctuate around 100 (Table 5.2). This fishery is seasonal and only occurs during the nights around the new moon and targets sardines. Small ring nets, with fine mesh size, are also used by *ngalawa* and *mtumbwi* to capture sardines (*dagaa*) in inshore waters during daytime. Unfortunately the use of fine mesh ring nets during the daytime targets juveniles of other species, as well as Caesionidae (fusiliers), bonito and trevally (*kolekole*). The latter are best caught with gill nets so that only adults are taken.

Senga (scoop nets): These are used mainly for prawns and have fluctuated in number with a big increase in 1998 (Table 5.2).

Juya (Beach seine or pull seine nets): (sometimes called *makoro* when small, Gorman 1995). These have been in use since about the 1960s, and are often used by visiting fishers, particularly from Zanzibar where their use was banned before the TCZCDP started (Bensted-Smith, 1988). Certain villages in Tanga Region appear to specialise in their use, such as Sahare and Mkwaja in 1995 (Gorman 1995). They are operated by crews of 10-20 men, whether deployed from the beach or from a boat, and are expensive and therefore owned by older successful businessmen. According to Gorman (1995), they tended to be the highest earners in 1995 (“one Kipumbwi man estimated his annual income as 2.5m Tsh, while another estimated his at 1.2m Tsh”). They were banned on the mainland in November 1998 (after the March 1998 frame survey), because of their destructive effects on bottom habitat, and so are not recorded in the 2001 frame survey data (Table 5.2), although they are still used illegally (section 5.7).

Dhulumati or kaputi (long lines): these have up to 10 hooks that are baited and bottomset overnight from *mtumbwi* and *ngalawa* usually around shallow reefs (Gorman, 1995). They increased in number between 1998 and 2001 (Table 5.2).

A number of other gears are used that are not recorded in the frame surveys. Cast nets (*Vimia*) are used to catch small fry off the beach, often for bait. Other gears include drift fishing (for pelagics), stake nets and fence traps. Spears (*bunduki*) are commonly used for lobster and octopus, and also several finfish, even though they have been illegal since 1970. For example, in the survey by Gorman (1995), Kigombe village fishers estimated that 40% of the catch was caught by divers with spears. Spear-guns were banned in 1970 but are still widely used because they are inexpensive, being generally home made, and are often used by fishers who cannot afford a boat. They are reputedly also used for sport fishing by some of the expatriots in Tanga. Poisons and explosives are also still used (see section 5.7).

5.3.4. Fishing grounds

The artisanal fishery is largely coral reef based, but sea grass beds and other habitats are also used depending on the species sought and gear types used. Data collected since 2001 through the TCZCDP indicate that fishers in Tanga Region recognise at least 512 specific fishing grounds by name¹⁰. Each CMA therefore has a large number for example, there are 44 known grounds in Mtang'ata CMA, and about 40 in Boza-Sange, with nine grounds occurring in more than one CMA. Some are used more than others, such as those close to Tanga City where the main markets are located (Table 5.3, Anderson 2004). Individual 'fishing grounds' may be

¹⁰ The locations of only 112 are known by the TCZCDP.

Table 5.3. Sample of 6151 fishing trips to different fishing grounds over the period 2001-04 (adapted from Anderson 2004)

Fishing ground	CMA where located	Home CMA of fishers	No. of Trips	% of all trips
Mwani*	Boma-Mahandakini	N/A	N/A	N/A
Wamba*	Deep Sea Boma	N/A	N/A	N/A
Jambe**	Mwarongo-Sahare	Mwarongo-Sahare	182	3
Karange	Mtang'ata and Mwarongo-Sahare	Mwarongo-Sahare	1439	23.4
Funguni	Mtang'ata	Mkwaja-Sange/ Mwarongo-Sahare/ Mtang'ata	676	11
Majivike	Mtang'ata	Mtang'ata	657	10.7
Chanjale**	Mtang'ata	Mtang'ata	213	3.5
Upangu**	Mtang'ata	Mtang'ata	167	2.7
Kange	Mtang'ata	Mtang'ata	135	2.2
Kandacha	Mtang'ata	Mtang'ata	97	1.6
Kitanga**	Mtang'ata	Mtang'ata	83	1.3
Taa**	Mtang'ata	Mtang'ata/ DeepSea-Boma	200	3.3
Rasini	Mtang'ata	Boza-Sange	54	0.9
Dindini	Boza-Sange	Boza-Sange	147	2.4
Mkadamu	Boza-Sange	Boza-Sange	105	1.7
Kijambani	Boza-Sange	DeepSea-Boma	324	5.3
Stahabu	Boza-Sange	Boza-Sange	226	3.7
Mijimile**	Boza-Sange	Boza-Sange	82	1.3
Dacha	Boza-Sange	Boza-Sange	67	
Fungu Zinga*	Boza-Sange	N/A	N/A	N/A
Sange	Boza-Sange and Mkwaja-Sange	Mkwaja-Sange	22	0.4
Vijamba tisa	Mkwaja-Sange	Mkwaja-Sange	49	0.8
Mafui	Mkwaja-Sange	Mkwaja-Sange	26	0.4
Kisiki Mtu*	Mkwaja-Sange	N/A	N/A	N/A
Mkangaja*	Mkwaja-Sange	N/A	N/A	N/A
Mkondoni	Any Open Water	Mkwaja-Sange/ Boza-Sange/ Boma-Mahandakini	944	15.3
Topeni	Any Open Water	Mtang'ata	70	1.1
		Total	6151	100

Source: TCZCDP monitoring data

* = no data on fishing trips, but known to be a fishing ground as it is one of the monitoring sites

** = coral reef monitoring site

whole reefs, parts of reefs, and also non-reefal areas (Gorman, 1995; Anderson, 2004) and vary in size. McClanahan *et al.*, (2006) recorded the areas of four fishing grounds/reefs: Funguni (3.0km²), Chanjale (1.5km²), Taa (1.0km²), and Makome (0.25km²).

Not surprisingly, fishers tend to use the grounds closest to their villages most often, and most fishing trips are to fishing grounds within the home CMA of the fisher (Anderson 2004). For example, of the nine Mtang'ata fishing grounds that feature in the sample of fishing trips shown in Table 5.3, six were used only by fishers from villages from Mtang'ata CMA; of the six Boza-Sange fishing grounds shown, five were used only by fishers from Boza-Sange CMA. Two fishing grounds shown lie across the boundary of two CMAs: Sange and Karange these seem to be used predominantly by fishers from one of the CMAs in which they lie. Nevertheless, trips are also made to fishing grounds in other CMAs. For example, in Mtang'ata CMA, Funguni is used by fishers from Mkwaja-Sanga and Mwarongo-Sahare as well as Mtang'ata fishers; and Taa is used by Deep-Sea Boma fishers. In the sample shown in Table 5.3, Rasini (in Mtang'ata) was used only by fishers from Boza-Sange, and Kijambani (in Boza-Sange) was used only by fishers from DeepSea-Boma, a considerable distance to the north; these fishers probably camp.

The majority of fishing trips, according to Table 5.3, are made to Karange (23% of total), Funguni (11%), and Majivike (10%) fishing grounds, all of which are close to landing sites in Tanga City with easy access to markets. Two 'fishing grounds' are described as open water; these are the non-reef areas between the patch reefs referred to as 'Topeni', and the waters beyond the outer reefs, referred to as 'Mkondoni'. These areas are used for 18% of fishing trips, by fishers from several different CMAs.

5.4. Fisheries monitoring

The DoFi samples catches (a creel-survey) at the markets at six landing sites: Moa, Kwale, and Kigombe in Muheza; Tongoni and DeepSea in Tanga; and Kipumbwi in Pangani. Data are collected on 16 days each month for the following parameters:

- Effort: date and arrival time; vessel type and registration number; gear type, number and size; number of crew; time spent fishing;
- Catch: weight and number by species
- Value: beach price by species



Since 1995, the TCZCDP has operated an independent system, using community members who have been trained by TCZCDP technical advisers and staff, with subsequent refresher training as necessary. The monitors are paid compensation (Tsh 2000 (c. \$2.00) per day) for missed income. This separate system was introduced partly because of the perceived unreliability of the DoFi system, and partly to introduce some stratification into the data, that is, differentiation between vessels, gears and fishing grounds. The

TCZCDP was anxious to have data collection protocol that would allow measurement of the impact of management interventions, and it progressively evolved over the course of the programme. The issue of two monitoring systems is discussed in section 5.8.3.

The first protocol was limited to boat type, gear type, and number of fishers and trips and excluded effort, or time, spent fishing. This protocol was used at three villages: Kigombe (the location of the first village action plan), Kipumbwi and Ushongo. The data sheet was largely based on that used by the DoFi and the name of the fisher was recorded. The same data collectors and sampling regime as DoFi (16 days each month, with an expected 100% coverage of fishing effort) were also used but data were collected at the fish auction sites, rather than the landing sites. Since the people who take the fish from the beach to sell are not always the crew (they may be relatives or casual labour), they did not necessarily provide all the correct facts about the fishing trip when interviewed by the data-collector. Furthermore, zero-catches and small catches for home consumption were not reported (subsequent monitoring showed that, for some gears, nearly a quarter of fishing trips may have zero catches). In order to look at the population structure of the catch, length-based data were recorded, in four length classes until 1997, and then again from 1998 in three length classes (Anderson, 2004).

The protocol was revised and improved in 2001 (2nd Protocol) to include hours spent fishing, which allowed for calculation and analysis of catch per unit effort (CPUE). At the same time, data collection was moved to the landing sites which allowed the collection of a more representative range of catch and effort data, including zero-catch data and small catch-weights, and more villages (13) were involved. Sampling stratification was further improved in 2003, such that data could be reported by District and month. Each of the villages in a particular CMA was sampled four times every year for a period of one month. Detailed fishing effort, in hours-per-trip, was reintroduced. Data-collectors were instructed to sample at least 20% of each vessel/gear combination and had to use a pre-defined species list (11 groups of fish and 22 explicitly identified species). Fish that were not on the list were recorded as 'others'. The aim of this was to encourage data collectors to differentiate between species. For Siganidae, for example, data collectors were asked to record either the non-specific local name (*chafi*), or one of two common species, *Siganus sutor* and *Siganus luridus*. For Lethrinidae and Lutjanidae, data collectors could record *changu* (the most widely-used Kiswahili name), *changu-doa* (*Lethrinus harak*) or *changu-njana* (*L. lentjan*). Although advantageous in some ways, the combination of local and scientific names resulted in the loss of some potentially useful information. For example, *changu* includes both lutjanid and lethrinid species.

The third protocol revision, in March 2003, was in association with the Regional Fisheries Information Systems/Southern Africa Development Community (RFIS/SADC) project which was assisting the DoFi to improve its catch monitoring. This 3rd Protocol was based on the approach, outlined by FAO (Anon 2002), of stratified sampling in space and in time. It ensures that the 13 villages and vessel/gear combinations are sampled consistently every month (six days per month).

5.5. Catch composition and trends

5.5.1. Species involved

A large number of fish species are taken, as is typical of such inshore reef-based artisanal fisheries, with 24% of catches comprising more than one species (Anderson 2004). Species taken vary according to gear type, season, habitat (e.g. there are significant differences between reefs and seagrass beds) and fishing ground.

The predominant finfish groups involved are:

- Lethrinidae and Lutjanidae (emperors and snappers - *changu*) taken mainly with *mishipi*
- Siganidae (rabbitfish - *chafi*) taken mainly by *mishipi* and *madema*
- Rays taken by *sinia*
- Sharks, kingfish, and other large fish: taken mainly by *jarife*
- Small sardines (*dagaa*) caught with purse seine/ring nets.

An analysis of the catch by fishers at Kigombe from 1995-1999 showed that 40% was inshore fish, 32% rays, 21% offshore fish, 6% sharks, and 1% other species (Horrill, 1999). This has changed little since: Anderson (2004) found that the artisanal fisheries of Kigombe were predominantly inshore handline fishing with catches comprising 39% emperors and snappers, and 19% rabbitfish; inshore trap fishing with catches comprising 81% rabbitfish; and gillnets with catches comprising 72% rays. The remainder of this chapter discusses the artisanal finfishery in more detail.

Numerous invertebrate species are also fished, but were not a focus for the TCZCDP.

- Prawns (*uduvi*) are exploited artisanally mainly by women using drag nets and casting nets (*kimia*). The main areas are Buyuni and Saadani, south of Mkwaja (Pangani), Geza (Tanga), Pangani river mouth, and other places where streams flow into the sea. Prawns are abundant during the rains, and *uduvi* fishing is more intense at that time (Gorman, 1995).
- Octopus are collected from intertidal reef flats and subtidal inner reefs, on foot or by snorkelling. A stick or metal spear is used. *Octopus cyanea* is the main target species and usually comprises 99% of the catch.
- The main sea cucumbers exploited are *Thelenota ananas*, *Stichopus hermanni*, *S. chloronotus*, *Holothuria scabra*, *H. atra*, *H. nobilis*, *H. fuscogilva*, and *Bohadschia* sp. Dried sea cucumber is known as 'trepang' or 'béche-de-mer'. They are hand collected on the intertidal reef flat when walking and, now that shallow-waters have been depleted, more commonly in deeper water either by snorkelling or using SCUBA or hookah.
- In 1998, the spiny lobster fishery in Tanga Region, was dominated by three species: *Panulirus ornatus* (50%), *P. longipes* (20%), and *P. versicolor* (20%) (E. Allard in Marshall *et al.*, 2001). They are taken with spears (Gorman, 1995) although according to Marshall *et al.*, (2001) the most common method in Tanzania is to scare lobsters out of hiding using a live octopus on a stick.
- A wide variety of molluscs are harvested for food and for their ornamental shells.

5.5.2 Catches for the Region

Between 1970 and 1993 (i.e. before the Programme started), government statistics show that total catches of finfish for Tanga Region fluctuated between 3,400 and 7,600 metric tonnes (mt) (Fig. 5.1) (NRI, 1993; Beckley *et al.*, 1997, Wells *et al.*, 2007), and annual catch per fisher had declined from 2.4 mt in 1970 to 1.0 mt in 1993, presumably linked to the doubling of fisher numbers (Beckley *et al.*, 1997).

The decline in catch for demersal and large pelagic species may have been even more severe because the total catch figures include the stable yield from the small pelagic fishery for *dagaa* (sardines, Indian Mackerel), developed during the 1980s, which will have slowed the overall

decline in fish yield (NRI, 1993). Catches between 1990 and 1995 were thus well below the 5 mt per km² considered to be the average maximum yield from coralline continental shelves (Munro and Williams 1985, Beckley *et al.*, 1997), though much higher yields have been reported in the Philippines by Alcala and Russ (1990). The 1997 study concluded that these trends were “indicative of serious problems within the coastal fishery that can probably be related to destruction of the most productive areas (reefs and mangroves) and overfishing”.

Using TCZCDP data, the average annual catch for the three Districts for the years 2002-2004 is 7,000 mt (Table 5.4), suggesting little change since the early 1990s. However, there is some indication that annual catch per fisher has increased. Using 7,000 mt as the average annual catch and 4,400 as the average number of fishers for 1995-2001 (Table 5.1), the estimated annual catch per fisher has been about 1.6 mt in recent years. This calculation is crude but suggests a 60% increase in annual catch per fisher (from 1.0 mt to 1.6 mt) during the course of the Programme.

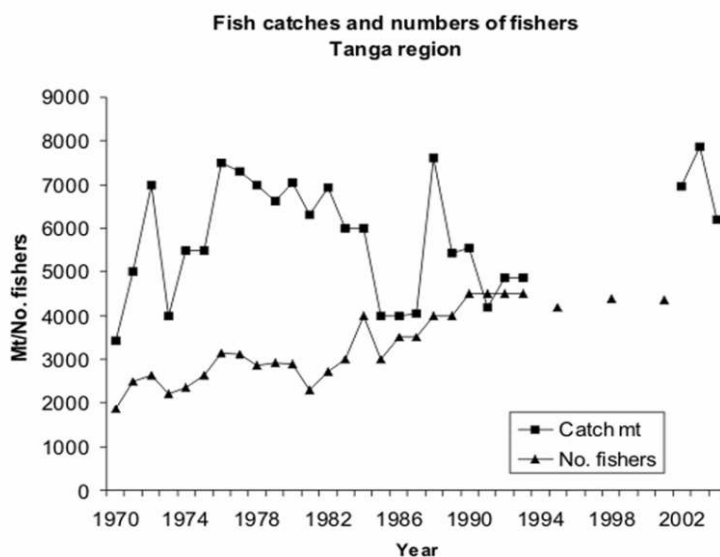


Figure 5.1 Trends in fish catch and numbers of fishers, 1970-2004, Tanga Region (source: Wells *et al* 2007)

5.5.3 Catches at District level

There is considerable difference in fish catches between the Districts. Tanga City records the largest annual catch (by a factor of four, Table 5.4) because it is the main market and best distribution and selling point, and perhaps also because of the large *dagaa* fishery. Although it is often reported as the poorest District, Pangani has the second largest catch, perhaps because it has a large area of fishing grounds, and in general reefs in this District are healthier (see Chapter 6). Muheza records the lowest annual catch, possibly because fish caught in Muheza are often landed in Tanga City and thus not recorded in the Muheza District statistics. Given the differences between Districts, it can be expected that catches within the different CMAs also vary significantly, reflecting their different ecological and socio-economic characteristics. There is insufficient data to allow comparison between CMAs (Anderson 2004), and a full analysis of the location and use of different fishing grounds in relation to the CMA boundaries has yet to be made.

Table 5.4. Estimates of annual catch/value by District, 2002-2004 (source: Anderson 2004)

District	Year	Est. Catch (MT)	Est. Value (Tsh)	Est. Value (USD*)
Muheza	2002	1,016.18	527,192,239	483,663
Muheza	2003	639.24	377,365,104	346,207
Muheza	2004	676.34	481,237,536	441,502
Pangani	2002	1,760.23	579,271,330	531,442
Pangani	2003	1,328.99	426,303,171	391,104
Pangani	2004	940.84	344,601,172	316,148
Tanga	2002	4,189.90	2,365,675,317	2,170,344
Tanga	2003	5,912.22	2,514,534,532	2,306,912
Tanga	2004	4,571.39	1,767,872,393	1,767,872
Total	2002	6,966.31	3,472,138,886	3,185,449
Total	2003	7,880.45	3,318,202,807	3,044,223
Total	2004	6,188.57	2,593,711,101	2,370,551

* Tsh1090:1US\$

5.5.4 Catches for different gear types and species

Three vessel and gear combinations, namely hand lines (*mshipi*), traps (*madema*), and gillnets (*jarife*) deployed from outrigger canoes (*ngalawa*), dominated catches in the Kigombe dataset (Anderson 2004). These data were analysed to look for changes in CPUE, mean size of major species groups being caught, and the relative contribution of low value small-sized fish, over the period 1995-2004, as detailed below. The data relate mainly to Mtang'ata CMA, where there have been two reef closures: Kitanga and Upangu from 1997 to 1998, and Makome and Shenguwe reefs from 2001 to present. No restrictions are in force for visiting fishers. Major efforts have been made to reduce dynamite fishing (since about 1995) and beach-seine netting (since late 1998) (see section 5.7). In assessing the following results, however, it must be remembered that effort data were not collected during the earlier years of the TCZCDP, sample sizes were highly variable and long-term monitoring was limited to only one of the pilot villages, Kigombe.

Handline fishery: There was no significant increase in the CPUE (kg/gear/trip) for fishers using hand lines between the years 1996 and 2002, but the CPUE for 2003/04 was statistically higher than previous years at nearly 4 kg/line/trip for all species aggregated (Fig. 5.2a), which may be a fluctuation or the beginning of a trend. Looking at snappers and emperors only (*changu*), which comprise about 40% of the catch-weight of this gear and are the largest single contributors to the catch, the upward trend in mean annual CPUE is stronger, with a catch rate of about 3 kg/line/trip (Fig. 5.2b). Although there was an apparent decline in CPUE in 2002 this decline was not significant, suggesting that catches of snappers and emperors caught by hand lines are at least stable, and increasing recently (Anderson 2004).

Between 1995 and 2001 TCZCDP fishery data collection recorded all snappers and emperors as a single group (*changu*) and so any differences in trends in catch rates of different species could not be seen. In a study of a similar small-scale coastal fishery in neighbouring Kenya, which

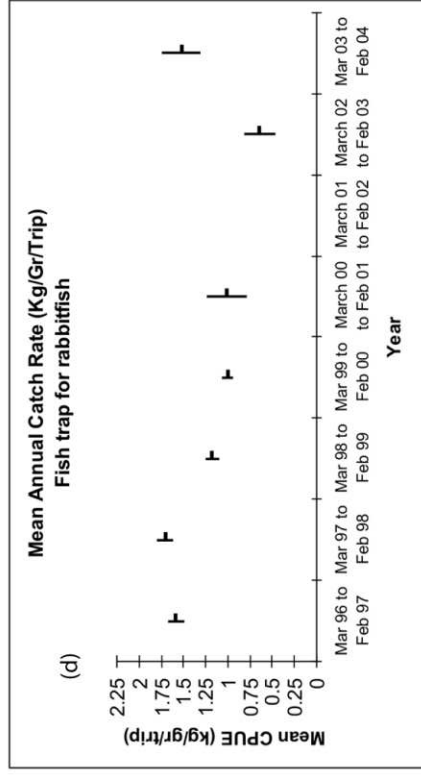
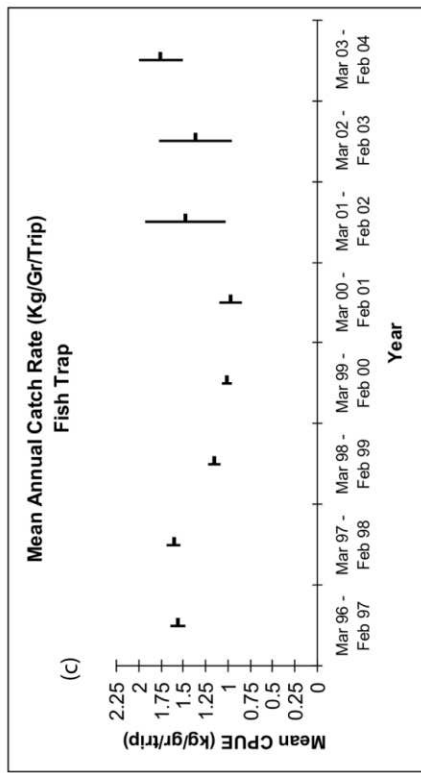
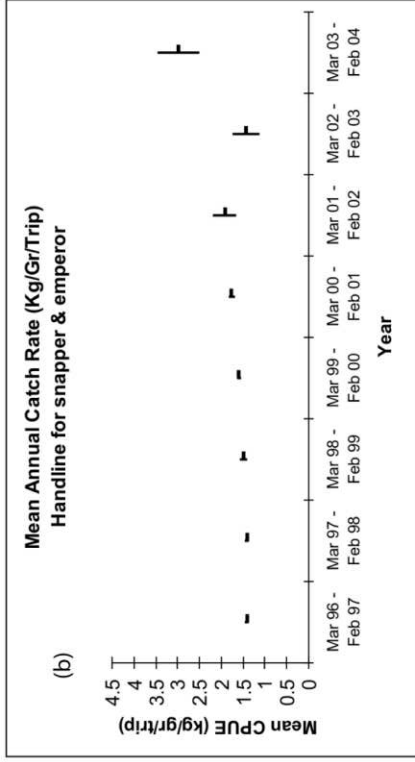
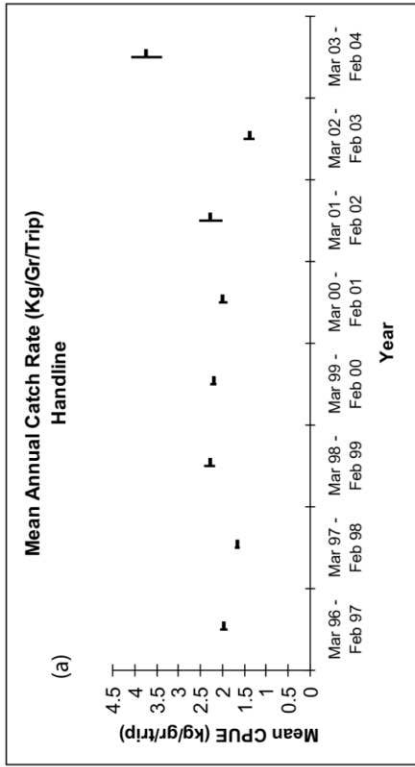


Figure 5.2. Mean annual CPUE (kg/gear/trip, with 90% CI) landed at Kigombe village from outrigger canoes, 1996-2004, for (a) all species caught with handlines; (b) snappers and emperors caught with handlines; (c) all species caught in traps; (d) rabbitfish caught in traps (source: Wells et al 2007).

recorded individual species, *Lethrinus mahsena* (~28%) and *L. lentjan* (~27%) were the dominant emperors in hand line and large fish trap catches. *L. harak* was the most common emperor (~13%) in gill net catches but less significant (~2-3%) in fish trap catches (McClanahan and Mangi 2004). If these species also dominate the fisheries in Tanga, then the recent increases in catch rates can probably be attributed to them. Since 2001 *L. harak* and *L. lentjan* are being recorded specifically in the TCZCDP monitoring programme. The reef health analyses show that closed reefs are having a positive impact on the emperor/snapper population densities (see Chapter 6), and may thus also be contributing to the increase in CPUE. However they also shown a dramatic decline in these fish group densities in 2003 which has persisted until 2007 (Chapter 6). Ongoing monitoring of the handline fishery is needed urgently to see if the decline in fish populations is now reflected in the fishery.

Trap fishery: Mean annual catch rates for fish traps (*madema*) in the Kigombe fishery show a significant decrease from 1996 through 2001, with a statistically insignificant increase to 2003 (Fig. 5.2c). The CPUE trend for Siganidae (rabbitfish) alone, which typically comprises about 80% of the catch-weight of this gear, is similar with a decline from 1997 and indications of an increase in 2003 (Fig. 5.2d). The decline could have been due to the increase in the number of traps in 2001 (Table 5.2), which may have been linked to the gear exchange programme (see section 5.7.3). The independent data on herbivore populations monitored through the reef monitoring programme (Chapter 6) suggest that herbivores take time to recover: increases in these populations were only seen in the old CMAs, which might explain why overall the trap fishery has not responded positively to the TCZCDP until recently. A dramatic decline in herbivore densities in 2003 was also recorded though numbers have recently increased through 2005-07 (Chapter 6). An alternative explanation is that because the trap fishery operates largely in seagrass beds reef closures are not likely to have much impact on this fishery. It is also important to note that many of the reefs experienced substantial bleaching of corals in 1998 as a result of the El Niño event. It is known that such changes can have a significant effect on fish populations, increasing herbivores for example (Lindahl *et al.*, 2001). Thus, although the trap fishery analysis may indicate the beginning of a positive trend, it could also reflect short-term population fluctuations.

Gillnets and shark net fishery for rays: The ray fishery can be monitored by combining data for gillnets and shark nets. Mean annual catch rates for this fishery show a decrease in CPUE between 1996 and 1997, with a recovery in 1998 that continued through to a peak in 2000, but catch rates then dropped again to levels that do not differ significantly from the earlier years (Wells *et al.*, 2007). It is difficult to ascribe cause and effect for this pattern, but the recent decline may be a case of recruitment overfishing that had been reversed from 1998 to 2000 perhaps due to fishers moving out of this fishery and thus reducing effort. Rays (*taa*) generally occur in soft bottom habitats between reefs, though some species are associated with reefs. Since the primary interventions of the TCZCDP have been to eliminate dynamite fishing and beach seining, neither of which target rays, the gillnet fishery is not likely to have been affected directly by the Programme. To our knowledge there has been no research on the ray fishery in East Africa, a gap that requires attention.

5.5.5. Value of catches

Despite some signs of increasing catch rates in Tanga region, the available information suggests that revenue from catches has decreased over the period of the TCZCDP. Horrill *et al.*, (2001) calculated a 29% decrease in income per trip (from a five-month average of TSh 5,555 in April-August 1996 to TSh 3,963 from December 1999-April 2000) due to a 32% fall in fish prices from an average of 562 Tsh/kg in 1996 to 382 Tsh/kg in 2000. Horrill and co-workers interpreted this

decrease in price of fish as a decline in income to the communities. The estimated annual values of more recent catches are highly variable ranging from 250 Tsh/kg to 550 Tsh/kg, depending on the season (Anderson 2004).

Anderson (2004) found that price elasticity (i.e. how price varies according to market demand and supply) was low in Tanga Region - the market price of fish did not vary much in response to supply, except in one CMA (Boza-Sange). This implies that fishers will continue to supply fish whatever the market price rather than reduce their fishing when prices are high. The low price of fish could be seen as a benefit to the communities as more people can afford to eat fish, a hypothesis born out by preliminary information from the socio-economic assessment undertaken as part of the CORDIO/SEMP programme which indicates that fish are now being eaten three times a day, a big increase on the past (CORDIO East Africa *unpubl. data*). A further factor is the reported increase in demand for fish in Arusha which is being supplied by Tanga (information provided during the 2004 lessons learnt workshop). Relationships between fish prices, fish catches, market response and trade development need further clarification before we have a full understanding of how the value of catches affect both village economies and fish stocks.

5.6. Compliance and enforcement

The urgent need for improved fisheries compliance and enforcement, particularly to halt illegal practices such as dynamite fishing, was identified early in Phase I during the development of the first village action plans. Previously, local Fisheries Officers from a central base in Tanga undertook land and sea patrols. Gear was inspected at the landing sites and fishers suspected of having caught fish using illegal methods were detained, but there was no inspection of gears being used on the boats. This was not very effective and so, using an adaptive management approach, other approaches were tested, particularly the more direct involvement of the villages. This aspect of the TCZCDP proved particularly challenging, and the efforts undertaken are therefore described here in some detail.

Compliance can be measured through i) the number of recorded incidents of illegal practices, and ii) the number of successful prosecutions brought to court. The TCZCDP monitored both indicators.

5.6.1 Patrolling and surveillance

Regular land and sea patrols were undertaken by the TCZCDP, and the following information collected during each patrol:

- Date and time
- Composition of the patrol team
- Area covered by the patrol
- Observations made
- Incidences of illegal fishing observed
- Measures taken to curb the observed incidences.

Boat patrols include inspection of gears, licences of fishers and vessels, and boat registration. If there is no Fisheries officer in the patrol to carry out an arrest, the suspects are taken to a nearby fisheries landing station. The fisheries officer on duty and the VeMC make routine inspections of gear at beaches/landing sites. The patrol units decide themselves on the times and days to patrol. Boat patrols are often undertaken during spring tides (the peak period for dynamite fishing) or when incidences of illegal fishing are reported.

The patrolling mechanism has evolved over time as follows:

1. In Phase 1, the pilot villages decided to enforce the village action plans themselves. Patrol units were established in each village, run by the VeMCs who operated the boats and planned the patrols. The TCZDP provided VHF communication radios to the villages and the patrol boats which are maintained by the villagers; fishers man the patrols in collaboration with local government enforcement officers (Horrill *et al.*, 2001). These patrol units managed to reduce illegal fishing by villagers, required little funding beyond the boats and equipment, and led to a sense of ownership by the pilot villages. But they had little impact on fishers from outside, tended to promote conflict with neighbouring villages, and tended to make the villagers vulnerable to repercussions. Although the DoFi was supportive, other government agencies such as the marine police, Navy, and judiciary, felt little need to be involved.
2. In 1997, the Marine Police were brought in which increased the number of apprehensions and prosecutions and had more impact on illegal outsider activities. However it also increased costs as the police had to be paid *per diems*, and this approach did not reduce the incidences of threats through weapons and dynamite, and there was still lack of support of the judiciary, shown by the low penalties imposed.
3. In 1998, the Marine Police were withdrawn and some of the villagers were given militia training. This increased ownership and involvement by many villagers and reduced costs, but there were fewer prosecutions and increased threats of violence and incidences of illegal fishing.
4. The Programme asked for assistance from the Navy, which had been granted a civil role in 1994. In July 1998, DoFi had done a joint patrol with the Navy of the entire mainland coast which was considered a success in terms of reducing dynamite fishing. Joint patrolling in Tanga Region with the Navy led to more apprehensions and prosecutions, fewer incidences of illegal fishing, and greater safety of equipment and personnel. However, it increased costs (although these were lower than using the Marine Police) and there were complaints of excessive use of force by naval officers. Guidelines were therefore produced jointly by the TCZCDP and the Navy to explain the legal basis for enforcement and the rights of the civil population. Offences were clearly explained and the locations where they applied (e.g. marine reserves, management areas, entire coastline), the roles of responsible agencies were clarified (communities, navy, police, village, primary and district courts), and the punishment appropriate to each offence was specified. The guidelines were translated into kiswahili and distributed to the Navy, Police, prosecutors, villagers, magistrates and relevant officers in the District and Region. They were considered successful in reducing abuses.



5. By Phase III, there was one patrol unit in each of the six CMAs. The Navy and villagers staffed three of the bases and villagers alone staffed the other three. The TCZCDP had provided six boats. The VeMCs plan the patrols and manage the boats, while the Districts provide fuel. Patrols cover each CMA and the adjacent mangroves and beaches. Since Navy personnel are not allowed to act as witnesses, the patrol teams include DoFi and/or Forestry officers as well as villagers. In 2001, the situation began to deteriorate. Police investigation of cases was beginning to take longer, arrest reports were not always produced, and the role of the Navy was being questioned. The Navy signed a letter of agreement about enforcement arrangements with the Region, the TCZCDP reviewed the patrol system, and there were discussions about how the costs of the Navy's involvement could be covered.

In November 2002 a workshop, attended by the Navy, Marine Police, villagers, fishers, Districts and VeMCs, was organised by the TCZCDP to review enforcement. It was recommended that the joint Navy and community patrols should be continued, and that the recommendations of the review of the patrol system should be implemented:

1. Data collection should be improved, ensuring that all key information such as date, location, and other observations, are included; and the logs should be properly stored.
2. Further training should be given to the patrol units, particularly on how to gather evidence and fill in the forms so that the right information is available to support prosecutions. For example, the marine patrolling form did not list the legal references for key offences.
3. The timing of patrols should be made less predictable, and sweep patrols by the Marine Police should be introduced;
4. Greater awareness among law enforcers be promoted, so that sentences are increased
5. Some additional and improved equipment should be obtained, particularly a large patrol boat for the rough weather (the kaskazi season).

Problems nevertheless persisted. In 2003, there were complaints from the patrols about delays in the supply of fuel. At least twice, patrol teams were found on duty but without paper and pens for recording evidence. Members of some VeMCs were known to collude with illegal fishers, for example informing them of planned patrol times. Prosecution was often difficult as offenders were relatives of the villagers involved in the patrols. However, despite the requirement that the Navy should undertake only short-term operations (all operations should be based out of Dar es Salaam), the TCZCDP managed to extend Naval support up until mid December 2004.

6. Since February 2005 there have been further problems, including the theft of boat engines and problems with the provision of fuel by the Districts due to late disbursement of funds. However, the TCZCDP state that a more intensive patrolling schedule was introduced in response to the increase in dynamite fishing in January 2005 (see section 5.7.1) in conjunction with the Marine Police and with funding from DoFi.

5.6.2. Prosecutions

The TCZCDP aimed to improve prosecutions, primarily by raising awareness in the government and judiciary of the ecological, economic and social impacts of illegal fishing techniques such as dynamite fishing, and of the economic value of the resources being damaged. When the TCZCDP started the prevailing perception was that dynamite was used only because of a lack of alternative fishing gears, but in fact it can yield 10-20 times more fish than traps or hand lines,

about the same as beach seines, but without the large capital investment. This misperception resulted in cases taking 1-2 years to be heard in court, a lack of subsequent hearings of many adjourned cases, and low fines imposed on convicted offenders.

Prosecution in Tanzania is often time consuming and complex, and corruption is openly acknowledged. Fisheries officers are responsible for collecting evidence, seizure and forfeitures, but are dependent on police officers for prosecution. These separate roles mean that police officers sometimes fail to present the necessary evidence with the law and thus do not secure convictions in court. Police officers are also less knowledgeable about fisheries legislation than they are about other aspects of the law, and tend to be less able to prepare comprehensive charge sheets: offenders are often acquitted because of 'ill-prepared' cases. When apprehended fishers are released on bail, which is known to frustrate the prosecution. Fines are regularly too low to act as deterrents. For example one dynamite fisher was found guilty and was offered a choice of a fine of Tshs 4000/- (c. US\$5.00) or jail for six months; not surprisingly, the fine was chosen and the fisher was set free (Shauri, 2003b). In Phase I, three fisheries officers (one from each District) were trained as prosecutors to help improve the situation.

In Phase II, the Regional and District Natural Resource Departments, with assistance from IUCN, designed and conducted two-day marine ecology courses, including field visits, aimed at magistrates, prosecutors, police, decision makers in Regional and District government and District Councillors. The course required participants to identify and analyse the economic and social consequences of the ecological impacts due to illegal fishing, the solutions to this problem and who should implement them. Practical exercises and field visits focused on how poor reef health leads to low fish catches and thus price increases, which affect those with fixed incomes, such as magistrates. In December 2001 (Phase III), a further course in marine ecology, including a field trip to mangroves, was held for prosecutors, magistrates and police officers. Between 1979 and 1992, only five cases of dynamite fishing were brought to court; of these, no judgement was given in three cases, and fines were very low in the other two (Horrill and Makoloweka, 1998). Following the TCZCDP training courses prosecutions reportedly increased in number and penalties were increased, although documentation is poor (Horrill *et al.*, 2001). However, recent reports from committees established to address illegal fishing in 2005 (see below) state that many of those in the judiciary and Police who were trained have since moved on and therefore the training needs to be repeated urgently, and regularly.

5.7. Illegal fishery practices

The primary fisheries legislation throughout most of the TCZCDP was the 1970 Fisheries Act, which was superseded by Fisheries Act 22 of 2003 which came into force in August 2005¹¹. The 1970 Act was supported by the following regulations:

- Fisheries (Principal) Regulations of 1989;
- Fisheries (General Amendment) Regulations of 1994;
- Fisheries (Prohibition of Use of Specified Vessels or Tools) Regulations of 1994.
- Fisheries (Miscellaneous Amendment) Regulations of 1998

¹¹ Through Government Notice No. 314 of 14 Oct 2005. 1 Aug 05 is deemed to be the commencement date of the new Fisheries Act.

The new Fisheries Act 2003 and its Regulations of 2005, largely reflect the 1970 Act, but revisions that affect the TCZCDP are: (i) provisions for management by local government authorities in line with the fisheries policy (although the Director of Fisheries is still the statutory officer in charge of fisheries management); (ii) establishment of BMUs (see Chapter 4); (iii) changes to some of the licensing arrangements such as beach seines (see section 5.7.2); and (iv) strengthening of enforcement, prosecution arrangements and penalties (for example the fine for a first offence is at least 200,000 TSh or imprisonment of 3 or more months)¹².

The establishment of BMUs provides an opportunity to give the CMA approach some legal basis nationally. Currently, the Director of Fisheries has recommended to the TCZCDP that the CCCs could be referred to as BMUs (both are groups of people). However, ultimately there would need to be amendments to either the legislation or the whole CMA concept/process for CMAs and BMUs to be harmonised fully (see Chapter 4).

5.7.1 Dynamite Fishing

The use of dynamite for reef fishing has been widespread in Tanzania for decades (Bryceson 1978, Bryceson 1981, Guard and Masaiganah 1994), despite being prohibited under the 1970 Fisheries Act. Penalties were laid out in the 1989 Fisheries Regulations; for first offenders, a minimum fine of 10,000 Tsh or prison for not less than three years, or both fine and imprisonment; for subsequent offences, a minimum fine of 300,000 Tsh or prison for not less than four years, or both fine and prison. These were revised in the 1998 Fisheries Regulations, which increased the fine for first offences to 300,000 Tsh and for subsequent offences to 500,000 Tsh, and/or a minimum prison sentence of five years.

In Tanga Region, incidences of dynamite fishing were common during the 1980s and early 1990s although very few boats was involved. At this time there was no regular monitoring but, based on fisher perceptions, an estimated 30-75 blasts occurred each month (Horrill *et al.*, 2001). When the TCZCDP started monitoring dynamite use, there were over 180 blasts in the

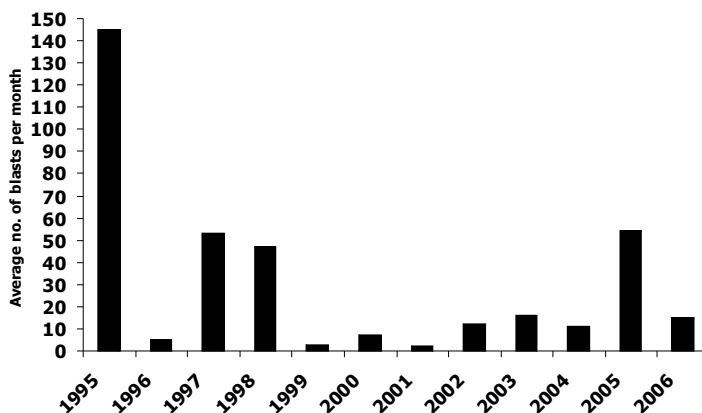


Figure 5.3. Recorded average number of blasts per month from dynamite fishing. Value from 1995 a minimum estimate. Data from TCZCDP (in litt. 2005), except for 2005 and 2006 which are from the Tanga Dynamite Fishing Monitoring Network (TDFMN).

¹² Note that this is still lower than first offences for dynamite fishing under the 1998 Fisheries Regulations.

single month of December 1995 but incidents dropped rapidly to almost zero the following year, a dramatic change attributed to the introduction of patrolling with the marine Police. Between 1996 and 1999, with a few exceptions, there were on average less than one incident a month, except in 1997 when there were up to 20 blasts in some months. The incidences were mainly in Mwambani and Kigombe at times when the patrol boat was not operational and the marine Police were not carrying out their job fully (Horrill *et al.*, 2001). When Navy support to the patrols was introduced, blasting incidences dropped again. Awareness of the long-term negative effects of dynamite fishing by communities reportedly resulted in more requests for enforcement against the few persistent dynamite fishers. This led to the perception that TCZCDP had brought this practice to a near halt by Phase III (Verheij *et al.*, 2004).

Dynamiting started to reappear in 2002/3 (Figure 5.3)¹³. As in Phases I and II, there was evidence in Phase III that dynamite fishing was linked to the effectiveness of enforcement; for example, blasting sometimes increased over the Christmas period when there was reduced support by the Navy. Blasting in early 2003 was thought to be related to easier access to dynamite from the bridge construction work underway on the Tanga-Mombasa road. The data suggests that dynamiting was declining again in 2004 and this could have been due to improved compliance. The new 2003 Fisheries Act (enacted in 2005) specifies the penalty of a minimum prison term of five years for use of dynamite and one year for possession of explosives, but there is no mention of fines. This may have acted as a deterrent since many people perceive these penalties to be more severe than the previous ones, although this is questionable, since the large fines have been removed, and there appears to be no option for both fine and imprisonment. The apparent decline in use of dynamite might also have been because, as the Phase III evaluation team found, the term 'destructive' fishing was being used in arrest reports for 'blast' fishing, as this results in a lower penalty for the offender. This means that there would be no record that explosives were used. There are mixed reports regarding the willingness of villagers to acknowledge the existence of dynamite or dynamite fishers in their community with some saying they are reluctant to do so, and others saying a blacklist of offenders' names can be easily drawn up. Certainly there were reported to be many requests from the communities to the patrols to take action against the dynamiters.

With the withdrawal of the Navy in mid-December 2004, the TCZCDP increased the number of patrols but by mid January 2005 there had been a dramatic increase in the use of dynamite (Figure 5.3). Large numbers of blasts were heard on a regular basis in 2005, monitored by the Tanga Dynamite Fishing Monitoring Network (TDFMN), a group of residents and hoteliers set up in late 2004 in response to the perceived increase in this illegal activity, and their perception of a lack of interest and passivity of the TCZCDP when such incidents were reported by stakeholders. The TCZCDP monitoring results show that there were 54 reported incidences of dynamite use in 2005, with blasting averaging at minimum 8 per month (the most conservative estimate has been used) and with a maximum of 50 blasts reported in March 2005.

The increase in dynamite fishing was not unique to Tanga Region, having re-surfaced in many other parts of mainland Tanzania in 2004 and 2005. In April 2005 Tanga Region received Tsh 2.1 million for enforcement from DoFi. In addition, the three new wider ranging patrol boats arrived, purchased by the TCZCDP. However there were significant delays in clearing these boats and they did not become fully operational until September 2005 when the Regional Commissioner commissioned one for each District, the old boats being retained as back-ups. A total of 67 patrols were carried out, supported by the Marine Police, with four court cases and

¹³ The figures provided by the TCZCDP for 2001-2003 are possibly an underestimate. The 2001 Annual Report states that there were 0-3 blasts/mth at the beginning of the year and 5-8 blasts/mth by the end of the year. The Phase III final report states that there were a total of 35 blasts in 2001. For 2002, the Phase III report gives a total figure of 26 blasts (average 2/mth). The TDFMN data are reported incidents, some of which comprise several blasts.

Tshs 390,000 collected as fines for various infringements. One hardcore culprit was sentenced for six months imprisonment for fishing without a license while his case of being in possession of dynamited fish was being investigated. Another culprit was remanded while waiting for prosecution for lying and obstructing the Police from carrying out their duty.

The large increase in enforcement resulted in a decline in the incidence of dynamite fishing later in 2005 and this continued until December. However, incidences were again very high in early 2006, with blasts averaging 18/month, approaching the rates seen in the early 1990s. This followed the theft of two of the new patrol boats, from the TYC where they were anchored, which were later recovered without their engines. The TDFMN continued their monitoring and maintained pressure on the authorities. In April 2006 DoFi stationed a patrol unit in Tanga which initiated a crackdown on all unregistered fishing vessels, as it was noted that these are the vessels most often engaged in dynamite fishing; over 50 vessels have been confiscated. A number of other measures have been instituted to target culprits on land, such as more frequent land patrols, the imposition of fish movement permits, and inspection of all fish storage facilities. The TCZCDP report that since October 2006, incidences of dynamite fishing have declined again and have remained at a low level due to these various enforcement activities.

As a result of the dynamite problems however, there is a new initiative. The then Regional Commissioner visited numerous coastal villages in all three Districts in an attempt to build a sense of responsibility among the village governments, VeMCs and communities in general, towards conserving coastal and marine resources. In Pangani and Tanga Town, stakeholders including hoteliers, fishers, council personnel and other private investors have joined together to form committees to monitor illegal destructive fishing. In Pangani the group is known as 'Friends of Maziwe', and has met twice since it was formed in November 2005 and is proving helpful to the regular patrols. The Tanga group, "Friends of Tanga Coral Reefs" was also established late in 2005 and has been active in meetings in 2006. Both illustrate a positive collaboration between the private sector, local government and villages to tackle this insidious problem. Finally, national scale intervention is now being planned with support from MACEMP and IUCN (2007, Tamelander (IUCN) *pers. comm.*).

5.7.2. Beach seines

During Phase I, beach seines or *juya* were being used by 47 fishing groups for *kavogo* fishing, which employed over 500 people directly, and involved numerous village-based processors (mainly women) who were also dependent on the catch. Regulating their use has been difficult, even though villagers recognise this gear to be damaging.

The Fisheries (Prohibition of Use of Specified Vessels or Tools) Regulations of 1994 prohibited the use of "fishnet or seine (*juya la kojani*), 'kavogo' type of fishing". However, since the term *juya la kojani* was used, rather than the more common *juya*, beach seines were still considered to be legal which made it difficult for the TCZCDP to offer any real assistance in enforcement. The subsequent Fisheries (Miscellaneous Amendments) Regulations, 1998, defined the gear more clearly but still used the name *juya la kojani*. At the end of 1998, therefore, DoFi confiscated 35 of the 47 beach seines to show that they were illegal, and the government announced that it would not provide assistance in the form of gears or subsidies to fishers who used illegal means to fish.

5.7.3 Gear exchange

The TCZCDP had already been looking at the potential for exchanging beach seines for less destructive gears, whilst taking into account the conclusions of Beckley *et al.*, (1997) that gear exchange programmes can be very difficult as they:

- are sometimes seen by fishers as a means of increasing production
- can encourage dependency of fishers on the government or donor-funded projects for provision of gear
- can lead to overfishing

A small gear exchange trial took place through the TCZCDP, in Pangani, at the request of fishers who exchanged their beach seine nets for gillnets, before the ban on beach seines was introduced in 1998. Fishers in Tanga and Muheza, did not want to be involved at this time. However, at the end of 1998, once the gear had been clearly declared illegal by DoFi, the TCZCDP expanded the gear exchange programme to Tanga and Muheza. The beach seine nets were measured and tagged, and groups were asked what they wanted in exchange. Thirty wanted gill nets, 12 wanted purse seines or ring nets and one, traps (Horrill, 1999; Horrill *et al.*, 2001).

The TCZCDP assessed the potential impact of this gear exchange programme (Horrill, 1999), and found that gill nets would increase in number from 76 to 312 nets in Tanga Municipality, and from 308 to 334 nets in Muheza. Length of gillnet per km of reef edge would thus be particularly high in Tanga where the reefs were already in very poor condition (Horrill, 1999). Using data from fish catches in Kigombe, it was estimated that fishing pressure might increase by 48% as a result of the increase in gillnets (Horrill, 1999), and would have a negative impact on fish stocks, turtles (through by-catch) and on species previously not caught by beach seines. The TCZCDP therefore recommended that the total length of gill net to be supplied should not exceed the length of the beach seines currently in operation. There were fewer concerns about purse seines or fish traps. The recommendations were approved by village representatives and relevant government personnel, as well as District Councillors and Members of Parliament.

A 10-point policy document to guide the process was drawn up (Box 5.1), translated into Kiswahili and distributed as leaflets to the groups, and District fisheries officers met with them to ensure they understood it fully. Fisheries officers re-negotiated the type and/or number of exchange gears with groups whose requests went beyond the limits set by the recommendations. The TCZCDP purchased the gear and the Districts drafted agreements with the groups regulating the use of exchanged nets; and once these were signed, the Districts implemented the gear exchange, which was completed in late 1999. Six groups in Tanga and two groups in Muheza received six pieces of gill net each; others were given handlines and traps; and some received purse seines, with the warning that they were not to be used as beach seines.

The fate of the exchanged gear was not subsequently monitored and records on incidences of beach seine use are poor. The Phase II evaluation report stated that purse seine (or ring) nets were subsequently used as 'drag nets' (for example, at Kipumbwi). No beach seines were reported in the 2001 frame survey, and numbers of gillnets increased by a third, traps almost doubled and longlines also increased (Table 5.2). This could be interpreted to mean that beach seines were effectively eliminated.

At the January 2004 lessons learnt workshop it was reported that seine netters are using traps, and Verheij *et al.*, (2004) maintained that the number of beach seines have been reduced by 85%. However, there is ample evidence that illegal use continues. According to apprehensions by the patrols between 2001 and 2003, recorded in annual reports, there were about 100

Box 5.1. TCZCDP Gear Exchange Policy (TCZCDP, 1999)

1. Exchange programme restricted to beach seine owners who are residents of Tanga Region; priority to be given to those villages involved in the CMA programme
2. Exchanges to involve only legal owners of beach seines, as identified by village fisheries sub-committee and/or village government, and only to those in possession of a valid fishing licence for gear and boat, and a registered boat.
3. Gears to be provided limited to: cast nets (netting and rope); hand lines (lines, hooks); long lines (lines, hooks, swivels, anchors, buoys); traps; gill nets (netting, floats, ropes); purse seine nets (netting, floats, ropes); trolling lines (lines, lures). Other gears to be considered only if environmentally friendly and economically feasible. Motors, shark nets and equipment that could be used for other purposes, not to be provided.
4. No exchanges for nets that had been confiscated.
5. All seine net owners to register their nets with their village fisheries committee, fisheries officer or village government before any exchange takes place.
6. All owners to produce their nets for inspection to a bona fide TCZCDP representative at a required time and place
7. After inspection and agreement on the type of gear to be received, a written agreement to be signed by both parties, describing the number and/or size of gear to be exchanged and the conditions of the exchange.
8. The nets not to be tampered with on the day of exchange.
9. TCZCDP to accept no responsibility for the maintenance of, or damage to, gears supplied as part of the exchange programme
10. TCZCDP to work with ZASCOL and Kingsway International to encourage out of work seine net crew members to take up seaweed farming and, in the villages of Ushongo and Tongoni, agriculture. A small trial of arrowhead traps to be developed in two villages.

incidents of illegal beach seining a year in Tanga, less than 20 in Muheza, and none in Pangani¹⁴. The Phase III mid-term review report states that beach seining was regularly taking place, particularly on days when the patrol boats did not go out, and the TDFMN reported occasional cases of beach seining in 2005 and 2006. The zero records in the frame survey may simply reflect the fact that the DoFi data recorders and beach seine crews were aware that this gear is illegal, and the category 'gillnets' may include gillnets that are deployed as beach seines. Under the 2005 Fisheries Regulations, beach seines are still banned in estuaries and inshore waters but may be used in waters >500m from the beach and >1000m from the lowest tidal level of estuaries. Minimum mesh size has been increased, as well as penalties. It is to be hoped that this further clarification and strengthening of the legislation will discourage the damaging use of beach seines in shallow waters, and promote their use in the manner originally intended.

5.7.4. Fishing on Closed Reefs

Sections 4 and 5 of the 1970 Fisheries Act allowed for the declaration of any area of water as a closed or controlled area, and this provided the legal basis for the CMA closed reefs. The 2003 Fisheries Act, Section 13 allows for the declaration of areas for the 'conservation of any critical habit or endangered species' and the prohibition of fishing within such areas. In addition, Section 17 allows the Minister to prohibit fishing in designated areas.

¹⁴ The Phase III final report gives a total of only 27 incidences for the period 2001-2003; report of the Phase III evaluation gives 24 incidences for Muheza, over 150 for Tanga and a few for Pangani.

Upanga and Kitanga (both in Muheza in Mtang'ata CMA) and Dambwe (in Pangani) closed reefs were declared in 1998 under Government Notice no. 625/1998. The Phase III evaluation pointed out that this notice had expired on 30 November 1998, and that the co-ordinates given for the closed areas are in fact those of the entire CMA. The closed reef at Maziwe, in Pangani District, is a Marine Reserve and fishing has been prohibited under the Marine Parks and Reserves Act since 1975, although effective enforcement did not start until the TCZCDP was initiated. The other reefs have been closed under village by-laws. Penalties for infractions are shown in Table 5.6.

Table 5.6. Penalties for fishing on closed reefs as specified in the CMAPs.

Closed reef	CMAP/District	Penalty
Bunju	Boma Mahandakini	100,000 Tsh fine; one year in prison; or both; confiscate gear, vessel and fish
Chundo-Kiroba	Deepsea Boma	20,000 Tsh fine; one year in prison; or both
Kipwani	Mwarongo-Sahare	20,000 Tsh fine; one year in prison; or both
Makome, Shenguwe	Mtang'ata	20,000 Tsh fine; one year in prison; or both
Dambwe	Boza Sange	No information
Maziwe	Boza-Sange	penalty according to Marine Parks and Reserves Act

Although the patrols record incidences of illegal fishing in closed areas, figures are available for only a few periods. The Phase III final report states that there were some 110 incidents in 2001, 78 in 2002 and 41 in 2003 suggesting that compliance with the regulations may be improving. Another source states that the number of incidents of illegal fishing in closed areas declined from around 50-60 in Tanga and Muheza in 2001 to about 20 in each District in 2003. In Pangani the incidence was low at around two a year (TCZCDP 2004). At the TCZCDP lessons learnt workshop in Feb 2005, it was reported that there had been four cases of illegal fishing in Maziwe and eight incidents on Dambwe reef for which the fishers were fined. Fines go to the village governments but there is no information on the sums of money collected. Illegal fishing within the closed areas may account for the lack of clear evidence of improvements in fish stocks and fish catches compared with other projects/countries where closed reefs have been more effectively enforced (see section 5.7).

5.7.5 Other infractions

Licences: The 1970 Fisheries Act required licences for all forms of fishing. The revised Act of 2003 exempts three fishing methods from licences: rod and line or handline from a beach (i.e. without a fishing vessel); fishing for prawns with cloths (*kutanda uduvi*); and fishing using small cast nets. Data are not available to show how well the licensing regulations have been enforced but it was reported during the 2004 TCZCDP lessons learnt workshop that when the Navy was brought in to assist with patrols, more fishers obtained their licences for fear of arrest.

Poisons: The use of poisons was prohibited under section 26 of the 1989 Fisheries Regulations, and the penalties were as for dynamite fishing. Under the 2003 Fisheries Act, possession of poison within the vicinity of a water body containing fish carries a penalty of not less than seven years in prison. There has been no regular monitoring of the use of this fishing method. Pangani reported eight incidences during Phase III, but Tanga and Muheza reported none (TCZCDP, 2004).

5.8. Conclusions and lessons learnt

5.8.1. Impact of the TCZCDP on fish catches

TCZCDP fishery monitoring data (CPUE) from 1995-2004 suggest that the target species of the handline fishery, the snappers and emperors, are at least stable and have been increasing recently. Snappers and emperors are species that are primarily associated with coral reefs, and the increase in their catch could be related to the reduction in dynamite fishing that occurred over the period analysed here and the subsequent improvement in reef health, as well as to the closure of some reefs (Chapter 6). Many of the species involved in the fishery have juveniles that live in seagrass beds before settling on reefs, and the reduction in beach seining may also have had a positive effect on their survival. However, the underwater fish monitoring data (see Chapter 6) show a dramatic decline in snappers and emperors in 2003 which has persisted to 2007. This is likely to have negative repercussions on the handline fishery catches but this has not yet been analysed.

The trap fishery, which targets herbivores, particularly rabbitfish, showed a decline in CPUE from 1997 with a small increase in 2003. The underwater fishery independent surveys (Chapter 6) found that herbivore densities have increased only on reefs closed for longer than five years, and that there was also a dramatic decline in herbivore density in 2003, though recent recovery (2005-07) is evident. These results suggest that the long term sustainability of the main artisanal reef fisheries in Tanga Region is in question under current fishing practices.

The evidence that TCZCDP fishery management interventions (i.e. closed reefs and improved enforcement of fishery regulations) have had a direct positive effect on fishery catch rates is weak. This is not surprising considering the monitoring data are complex due to changes in methodology; there was incomplete understanding of the fishery when the CMAPs were first developed; data collection is incomplete due to the avoidance of official landing sites by some fishers and the weak capacity of the data collectors; compliance of some fishers with the regulations is lacking, enforcement is at times poor, and a range of interventions were introduced over the same period. Teasing apart population fluctuations caused by management interventions from fluctuation caused by other “natural” changes in the marine environment such as coral disease and coral bleaching (Verheij *et al.*, 2004, see Chapter 6), is also notoriously difficult.

The results of an independent research study by McClanahan *et al.* (2006) may be interpreted as showing a positive impact of management interventions as they showed overall total fish biomass on the Tanga reefs had increased by 57% from 1996 to 2004. However, in contrast to the TCZCDP data, the increase was most noticeable in the herbivorous group of species, which included parrotfish (Scaridae) and rabbitfish (Siganidae). McClanahan and co-workers also found a significant decline in the carnivorous group comprising snappers, emperors, and grunts, which again contrasts strongly with the TCZCDP data which show increases in this group until recently (Chapter 6). This contrast in results may be due to two things: McClanahan *et al.*, (2006) surveyed at two points in time (1996 and 2004) whereas TCZCDP has been monitoring twice a year since 1998 and the data are based on 14 points of time (7 years), and therefore able to detect intra and inter annual changes. Secondly, of the four reefs surveyed by McClanahan *et al.*, (2006), three were open to fishing and one was not closed until 2001. The TCZCDP data show that the reef closures had the greatest impact on fish densities, but this was not true of herbivores, and that declines in density started in 2003.

McClanahan *et al.*, (2006) also showed that fish biomass was low on the Tanga reefs compared with that on reefs that are totally protected in nearby southern Kenya. The study looked at reefs in Kisite Marine National Park (MNP), where the total wet weight estimate of fish was about 2.8 times greater than on the Tanga reefs. The biomass of the carnivorous group was particularly low on the Tanga reefs, with 8 kg/ha compared with 250-300 kg/ha on the unfished reefs in Kisite MNP. These figures provide extremely useful targets for the TCZCDP and suggest that the number and size of closures should be increased, and that further interventions are required to reduce fishing pressure overall.

There is substantial scientific evidence that coral reef fish populations should be managed through permanent reef closures (due to their life history strategies, among other reasons, see Chapter 6), but this is not always easy for communities to understand. The TCZCDP is not alone in finding it difficult to demonstrate increased catches as a result of closed areas; there are still very few studies globally that clearly show a greater fisheries yield on a long-term basis in areas adjacent to no-take zones (Sale *et al.*, 2005). This is largely due to the complexity of these coral reef systems and associated fisheries and the difficulty of conducting empirical studies in these systems (Russ 2002). In addition, strict enforcement is required if closures are to be effective (Samoilys *et al.*, 2007) and this is not always easy. In the case of Tanga Region, the area closed to fishing is only a small proportion of the total stock area within the CMAs (2%, Chapter 4), much less than the 20-40% recommended in the literature for coral reef fisheries (Halpern and Warner 2002, Russ 2002, Roberts *et al.*, 2003), and little or no areas of other important fisheries habitats are closed.



It is significant however that communities in Tanga now support permanent reef closures. The next steps therefore for the TCZCDP should include encouraging villages to increase the amount of reef that is closed to fishing and improving enforcement and management of these, as well as monitoring and evaluation. The impacts of reef closures need further study, particularly design components including the ratio of closed to open areas and their size.

5.8.2 Invertebrate fisheries

Octopuses grow extremely fast, increasing in weight by as much as 200g in only ten days, and thus can potentially support a highly productive fishery. This is only possible if it is well managed, which requires a good understanding of the life-history. When females are ready to spawn, which happens only once in their lifetime, they barricade their den. Following spawning, they attach the eggs to the den roof, clean and aerate them for about 30 days, and then die. The 'brooding' is essential for successful hatching, and so a reduction of fishing pressure during this season is highly recommended. Furthermore, as females normally brood at their largest size, fishing of large individuals could reduce recruitment and eventually stock size.

A licensing scheme, agreed jointly by octopus fishers and DoFi would help to provide the information on catch and effort that is needed for management. It would also permit regulation of fishing effort by restricting numbers of licences. Maximum size limits should also be considered, although this might be difficult to implement as the value of octopus increases with weight. *O. cyanea* broods year round but with a peak in June-August in spawning activity. During such peaks it would be beneficial to either stop fishing or reduce fishing intensity. Several management recommendations were provided by Guard and Mgaya (2000) and have been adopted in Mafia Marine Park, Tanzania, where octopus fishing is prohibited during neap tides and there is a maximum size limit of 500gm.

Sea cucumbers are being overfished in many countries of the WIO (Conand *et al.*, 2006; Uthicke and Conand 2005, Mbagala and Mgaya, 2004). The 1995 rapid appraisal survey found low counts especially on coastal and inner patch reefs (TCZCDP unpubl. data), and this was supported by further monitoring and analysis (Othina and Samoilys 2005). Further research is needed for example if there are spawning peaks in sea cucumbers' reproductive cycles (similar to those for octopus), seasonal closures might then be an appropriate management approach.

Lobsters are considered to be smaller and less abundant than they used to be (Gorman, 1995; Marshall *et al.*, 2001). Research is badly needed for these species.

5.8.3. Fisheries monitoring

Monitoring artisanal fisheries is complicated, not least because they involve numerous species and multiple landing sites (Rawlinson *et al.*, 1995; King 1995; Die 1997). The experience of the TCZCDP demonstrates this clearly. Important lessons learnt include the following:

Data collection and analysis: The problems encountered in the collection, management and analysis of scientific data demonstrate the importance of seeking advice from scientists with fisheries expertise, and ensuring that the long term objectives of the monitoring programme and suitable indicators are identified as close to the beginning of a project as possible. Data analysis was particularly difficult as the method was progressively improved (three different data collection protocols were used), and data on fishing effort were not collected in the first protocol, which meant that catch rate could not be calculated. The data collection and analysis procedures were streamlined and improved in 2005, and a facility added to generate status reports through an overall Information Management System (Pabari *et al.*, 2005). All datasets, including those for reef health (Chapter 6) and patrolling are now in one database which allows analysis across them (e.g. patrolling versus benthic cover and fisheries versus reef health). The data collection protocols have been adjusted to meet international standards and the indicators have been refined as a result of the analysis of data collected so far, particularly the longer datasets (Anderson 2004, Pabari *et al.*, 2005, Othina and Samoilys 2005). This should ensure that in future data are collected correctly and are analysed regularly by District officers.

Harmonization of data collection programmes: The TCZCDP monitoring programme was not integrated with the DoFi system and there is a risk that it will not be maintained long-term. The DoFi has also had difficulties with data storage and analysis but a new ACCESS database was developed in 2002 through the RFIS/SADC project. Ultimately the two data collection systems should be linked.

Comprehensiveness of data collection: The TCZCDP's focus on coral reefs and associated fisheries meant that two of Tanga's primary artisanal fisheries – the trap fishery and the gillnet fishery were not fully addressed. The trap fishery operates largely in seagrass beds and so the reef closures are not likely to have had much impact on this. Similarly, rays, which are taken by gill

nets, occur in non-reefal sandy bottom areas and thus were not monitored independently by the TCZCDP. In future, the TCZCDP should consider monitoring seagrass beds and offshore sandy bottom areas and their associated fisheries. Rabbit fish (*chafi*), which dominate the trap fishery, have been identified as an important indicator in the new data analysis protocol (Pabari *et al.*, 2005, Chapter 6). The octopus, sea cucumber and lobster fisheries, whose populations are very low suggesting overfishing, should also be given further attention. Linking with regional expertise in sea cucumber fisheries is highly recommended (e.g. Mbagya and Mgaya 2004, Uthicke and Conand 2005, Conand *et al.*, 2006, Conand and Muthiga in prep.).

Inclusion of socio-economic data: Catches in artisanal fisheries are highly susceptible to local socio-economic changes and it is therefore essential to monitor these in order to obtain a full understanding of trends and their causes. The CORDIO supported SEMP programme has undertaken some preliminary monitoring in Tanga Region and is addressing these recommendations. The following parameters should ideally be included:

- Number of fishers: currently monitored only during the government frame surveys which, understandably, take place at most at 3-year intervals and often less frequently. A proxy estimate for fisher numbers could be developed.
- Fish prices, market response and trade development to properly understand what the value of catches does to village economies and also to fish stocks.
- Other characteristics of the fishers' life style, particularly those who migrate and those involved in dynamite fishing; this is essential in order to devise management interventions to halt destructive practices. Gear-switching should also be recorded: for example fishers may switch from handlines to nets when fish abundance gets too low, or may change gear if there are changes in species composition due to heavy fishing pressure.

5.8.4 Impact of the TCZCDP on fishing practices

Enforcement of fisheries legislation throughout Tanzania is a problem and Tanga is no exception. The long term financial sustainability of patrols, the funding of fuel and maintenance of boats, and community awareness and willingness to comply, are all issues that have yet to be fully resolved. Shauri (2003a) found that some villagers thought that when illegal fishing gear is seized, it should be destroyed immediately; others stated that they have no affordable alternatives to the illegal gear and recommended that the government should consider subsidising the price of legal fishing gear. Since the Programme started, more people have been willing to come forward and give evidence (reported at the February 2004 lessons learnt workshop).

The status and management of Tanga's artisanal fisheries also illustrate that the focus on gear regulations as a fisheries management approach, as opposed to fishery-specific regulations is problematic. Fishing is often damaging because the wrong gear is used in the wrong place for the wrong species. Fine mesh ring nets, for example, are acceptable for the night fishing of sardines, which can be a sustainable fishery, but if these nets are used during the day in shallow water they capture juveniles of other species, especially snappers and emperors, which is not a sustainable practice. Similarly, *juya* or beach seines and other drag-net gear designed for fishing small pelagics offshore are not destructive, but if adapted for use from the beach and dragged through shallow waters, as is now often the case in East Africa, the substrate is seriously damaged. It is therefore preferable to base fisheries management on species/gear combinations, with fishers licensed and managed accordingly.



Gear exchange programmes: Although theoretically gear exchange might seem a good option, it is relatively rarely attempted, partly because the long term impacts of changing gears cannot be predicted. Gill nets are clearly preferable to dynamite fishing, but nevertheless catch turtles and sharks, both of which are seriously under threat. The TCZCDP gear exchange programme was inconclusive as unfortunately it was not monitored; indeed there are very few well documented cases. In Montego Bay Marine Park in Jamaica, small mesh wire traps were exchanged for large mesh wire traps in 1993/94. Although initially successful, a second exchange was necessary because the number of fishers had increased, there was insufficient large mesh wire to exchange all the traps the first time, and there was lack of enforcement of regulations in the park (K. Clarke pers. comm, 2000). At Mafia Island Marine Park, small mesh seine nets were phased out by providing loans for set net fishing using gill nets, and also non-fishing small business enterprises were set up for beach seine fishers. 10 seine nets have been phased out since 2001/2, but eight were still in use in 2004 and there was some misuse of the new nets (WWF 2004). In both these instances, the long term impacts of the exchange have not been monitored or recorded.

Ban on dynamite fishing: Despite intensive awareness campaigns by the TCZCDP and regular patrolling, dynamite fishing has not been eliminated. Although there was an initial reduction, a small number of law-breakers remain in the communities and when enforcement relaxes or dynamite becomes more accessible they increase their activities. The Navy presence provided a strong deterrent, but enforcement alone is rarely a long-term sustainable option. Control of dynamite fishing, when this was successful, was a collaborative effort between government and communities, achieved through the use of joint community and fishery officer patrols and by raising awareness in the government and judiciary of the impact of this fishing technique.

Greater involvement of all the stakeholders, particularly the increasingly important private sector which is also opposed to dynamite fishing, is also required. The TCCF provides the structure for this. Those who use dynamite are generally well known to other community members, and traditional social sanctions could be one solution. It should also be possible to identify and prosecute those who are selling dynamite to fishers, and the establishment of simple 'sting' operations could enable the Police to control the sale of dynamite (Lewis and Juma 2005). However, greater commitment at the national level is needed given that dynamite fishing became such a significant problem in 2005 in many parts of the country. A previous outbreak of dynamite fishing, in the mid-1990s, was only halted when country wide and international media publicity triggered support at Ministerial level.

Lessons can be learned from the Philippines. At Danajon Bank, Bohol, a Fishers Alliance of over 700 fishers has been set up to help stop dynamite fishing and to protect the coral reefs and other fishing grounds (Vincent 2006). The Alliance operates over an area of 145km, and provides intense peer pressure within villages; fishers also send names of offending fishers, times, and locations of blasts to the police using their cell phones. The Alliance has empowered fishing communities to take the initiative and responsibility for their marine resources, and to work with the authorities (Vincent 2006). Such a structure exists in each CMA, through the VeMCs, the CCCs and the recently established TDFMN, Pangani and Tanga stakeholder committees.

5.8.6. Post-harvest operations and marketing

At present the government provides no support for these two important aspects of a fishery. Currently, the revenue earned by fishers is very susceptible to the market, so even if catches increase, returns may be low if prices are low due to poor quality and failure to meet required standards. Kigombe received a 3-ton cooler from the GoT through Regional Development Fund in 1974 to 1975 in exchange for the villagers regularly providing prawns and lobsters. However, the truck broke down and was not repaired. There are still no cooling facilities accessible to artisanal fishers and so unprocessed fish must be sold immediately. Ideally the TCZCDP should have addressed post-harvest and marketing issues as this is critical to the optimal use of fisheries resources (Shauri, 2003a).

CHAPTER 6: CORAL REEFS AND MANGROVES - MAINTAINING ECOSYSTEM HEALTH

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6.1. Introduction

As described in Chapter 5, a key objective of the TCZCDP was to make the artisanal fisheries of Tanga Region more sustainable, through a number of interventions that included improving the health of those ecosystems on which the fisheries depended, specifically coral reefs and mangroves. Monitoring of both ecosystems was thus an important component of the Programme. This chapter describes these two ecosystems, presents summaries of the monitoring data collected, and discusses the impacts of management interventions on the ecosystems.

6.2. Coral Reefs

Prior to the TCZCDP, studies of the Region's coral reefs had been sporadic and covered very few sites. Ray (1968) provided the earliest description but did not survey the reefs in any detail. It was not until TCZCDP undertook a participatory rapid assessment throughout the Region in 1995 that the reefs were described and mapped, coral genus diversity described, and the extent of reef degradation and the status of commercially important species assessed (Horrill *et al.*, 2000).

Tanga's reefs show latitudinal differences in benthic and fish communities and vary from inshore to offshore (Horrill *et al.*, 2000; Othina and Samoily 2005). Reefs occur along 407km of coastline (including bays and estuaries), and are categorised as fringing reef, outer patch reefs (adjacent to the continental shelf and in more than 25m of water) and inner patch waters (in less than 25m depth, and lying between the coast and continental shelf). The more northern reefs are extensive with sandy patches; the southern reefs are more discrete with higher coral cover. In 1995, reefs in the north (now the area of DeepSea Boma CMA) had notably low coral cover compared with other reefs.

The 1995 survey found that reef type influenced the abundance of some species, particularly benthic invertebrates. Numbers of coral genera increased from fringing reefs (median of 20 genera) through inner patch reefs (median of 24 genera) to the outer patch reefs (median of 28 genera), with a total of 47 coral genera recorded (Horrill *et al.*, 2000). Two outer patch reefs (Dambwe and Mijimile Ndogo) south of the Pangani River had the most genera (39 genera) in 1995. Lowest values (between 4 and 9 genera) were recorded on badly damaged reefs.

6.2.1. Reef Monitoring

6.2.1.1. Village Monitoring Team

Following the initial reef survey, a coral reef monitoring programme was developed, using people from the local communities. A Village



Monitoring Team (VMT) was established during Phase I and has progressively evolved. The team currently comprises 10 members, many of whom previously fished for lobsters using spears. Five of the VMT are 'core' members and are involved in monitoring all the CMAs and have been there since inception. The other five come from the CMA where the monitoring is taking place. The monitoring in each CMA is co-ordinated by a District officer.

Training of the villagers takes two weeks and is carried out by the regional reef monitoring coordinator. It involves identification of species, learning techniques for data collection, boat handling and safety, as well as swimming, snorkelling, a PADI medic first-aid course and accident management. Observers are calibrated to estimate benthic cover using the ranking categories of the manta tow method (English *et al.*, 1994) by practising this on land using grass, sand, rubble etc. Observers are then calibrated for the Line Intercept Transect (LIT) method (see below) to measure percentage cover. This is then repeated in the sea, and the calibrated cover estimates of the observers compared with those of the IUCN Technical Adviser. Prior to each new survey, there is a one-day refresher course.

6.2.1.2. Reef monitoring methods

Monitoring methods were meant to be simple at first, to then evolve and improve as understanding and skills of District staff and the VMT increased. The manta tow and LIT methods (English *et al.*, 1994) were first tested. Manta tows were found to be too difficult to coordinate so the Programme switched to drift swims, taking recordings every two minutes with a GPS and the observer's estimates. Multiple observers were used and they ranked the status of benthic cover, especially live coral cover. Coral genera and fish counts of selected indicator species were counted during a timed swim. Subsequently the LIT method was chosen, using some modifications, and building on experience of other monitoring programmes in the region (e.g. McClanahan *et al.*, 1999). Local names for fish species and benthic categories are used, as well as snorkelling rather than SCUBA (see Samoily 2004 for details).

Participatory monitoring requires rigorous control and calibration of observers. The TCZCDP arranged for the Institute of Marine Science (IMS) in Zanzibar to send scientists to Tanga to calibrate the monitoring programme. This should be done annually, but so far has only been undertaken in 2000 and 2002. The results were positive in that the VMT and the IMS staff obtained similar results. However, the checking did not pick up a significant design fault that had crept into the fish survey method (Samoily 2004). From 1998, only two replicate transects had been used, a level of replication that is too low for reef fishes given their variable densities and distribution (Samoily and Carlos 2000). For three years (1998-2000), each replicate transect was surveyed 1-4 times by different observers; from 2001-2003 each one was surveyed 8-10 times. This meant that for six years (1998-2003), there was inadequate replication and therefore the data are not likely to be able to detect changes. This problem was also found in the database where it is difficult to separate true replicates from the repeat replicates of the same transect; therefore the data are not fully reliable (Othina and Samoily 2005).

The review of the reef monitoring programme carried out by IUCN in 2004 concluded that although the team were using standard internationally recognised techniques for long term monitoring of reef resources, modifications were needed to address the issue of replication in the fish counts and to streamline procedures (Samoily 2004). The modifications were put in place in 2004.

The current VMT monitoring programme is as follows: ten randomly selected replicate transects are laid on each reef, and are used for (i) fish (50m x 5m), (ii) benthos (10m long line

intercept transects) and (iii) mobile invertebrates (10m x 5m). Prior to 2004 the fish transects were laid separately because they are 50m long and the benthos and invertebrate transects, both 10m long, used the same transect. All three are now combined to streamline the field work so that the first 10m section of a 50m transect for the benthos and invertebrates is made from a tape measure, with the next 40m made of weighted rope to continue the fish counts across 50m (Figure 6.1).

The same site is surveyed on each reef each year, with transects placed randomly within it. Sites are generally around 300m in length along the reef edge, with a width dictated by the 1-8m depth limit. The site is located using known land and reef marks and GPS coordinates.

6.2.1.3. Monitoring sites

Monitoring started on reefs that were part of the Village Action Plans for the three pilot villages (Mwambani, Kigombe and Kipumbwi) but the programme subsequently expanded and evolved to cover selected reefs in each CMA, ensuring that reefs both open and closed to fishing were included (Table 6.1). The VMT are now monitoring 18 coral reefs every six months, in the inter-monsoon periods in March and October.

6.2.1.4. Reef health indicators

Three parameter groups are monitored: reef benthos, selected mobile invertebrates and fish populations (Samoilys 2004).

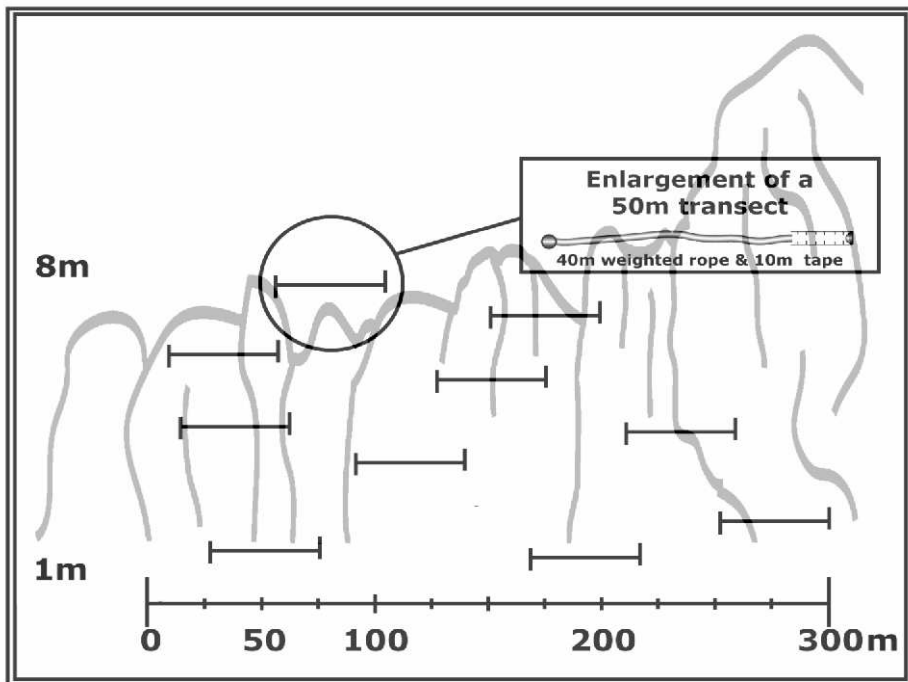


Figure 6.1. Diagram illustrating random placement of 10 replicate transects along a 300m stretch of reef within the 1-8m depth range. (Source: Samoilys 2004, illustration by B. McGraw)

Table 6.1 Reef monitoring sites within each CMA, with their status (open or closed to fishing). A new closed reef was established in Mkwaja-Sange in 2005 (Fungu Buyuni) but is not included here because there are no monitoring data from this reef.

Management Area (CMA)	Year Monitoring Started	Reef	Status (Year closure initiated)
Boma - Mahandakini	2001	Bunju Mwani	Closed (2001) Open
DeepSea - Boma	2000 2000	Chundo/Kiroba Wamba	Closed (2000) Open
Mwarongo - Sahare	2000 2000	Kipwani Jambe	Closed (2000) Open
Mtang'ata	1998 1998 1998 1998 2001 2001	Kitanga Upangu Taa Chanjale Makome Shenguwe	Closed (1997)-opened 1998 ^a Closed (1997)-opened 1998 ^a Open Open Closed (2001) Closed (2001)
Boza - Sange	1998 1998 1998 1998	Mijimile Ndogo Fungu Zinga Maziwe Dambwe	Open Open Closed (1975/1998) ^b Closed (1997)
Mkwaja - Sange	2000 2000	Makangaja Kisiki Mtu	Open Open

a Kitanga and Upangu were closed for one year only, from 1/12/1997-30/11/1998.

b Maziwe National Marine Reserve was gazetted in 1975, and therefore theoretically closed then, but this was not enforced. Enforcement was introduced through the TCZCDP in 1998, with support from communities within Boza Sange.

Table 6.2. Benthic fauna indicators

		Kiswahili	Comment
Hard coral (category includes fire coral)	Live	<i>Matumbawe hai</i>	Widely recognised measure of reef health
	Dead	<i>Matumbawe kufa</i>	Indicator of bleaching and COT damage, but breaks down over time to rubble
	Partially dead	<i>Matumbawe kufa kidogo</i>	Described by the VMT as 'coral that has lots of dead bits that are too difficult to measure'; Samoily (2004) recommended removing this category.
	Bleached	<i>Matumbawe hai meupe</i>	
	Rubble	<i>Kokoto</i>	Good indicator of dynamite use
Abiotic cover	Rock	<i>Mwamba</i>	
	Sand	<i>Mchanga</i>	
Biotic cover	Brown/green macro algae	<i>Mwani</i>	
	Seagrass Coralline algae Sponge	<i>Majani</i>	
	Soft coral	<i>Matumbawe laini</i>	
	Other (e.g. Invertebrates)		

Benthic cover: Live coral, dead coral and rubble are key benthic fauna indicators for examining trends in the health of coral reefs; five hard coral categories and several non-coral categories are used (Table 6.2).

Mobile invertebrates: Several mobile invertebrate species are counted including species taken in local fisheries (Table 6.3). Octopus and crayfish are both cryptic and spend large amounts of time hidden within the coral, and so density is likely to be underestimated. The VMT concur with this and observed that octopus are likely to be more abundant in the shallows whereas lobster are more abundant in deeper water, and that limiting surveys to 1-8m depth will not fully sample these species.

Fishes: The fish species surveyed are demersal (living close to the bottom habitat), reef or reef-associated fishes (Table 6.4), and include species exploited in local fisheries as well as typical indicator species of coral reef communities such as butterflyfish. The trevally or jacks (*kolekole*) are pelagic but tend to school close to coral reefs; visual surveys of these species tend to be less accurate because of their pelagic behaviour.

Table 6.3. Mobile invertebrates surveyed by 10x5m quadrats. 'Fishery species' indicates whether or not a taxa is exploited in local fisheries.

English/Latin	Kiswahili	Fishery species	Comments
MOLLUSCS			
Shells (molluscs)	<i>Makome</i>	Yes	Species taken for the ornamental trade (e.g. <i>Cypraea tigris</i> , <i>Charonia tritonis</i> and <i>Lambis</i> spp.)
Triton shell	<i>Gundafisi</i>	Yes	Taken for the ornamental <i>Charonia tritonis</i> shell trade; preys on COT (Moran 1997)
Spider shells <i>Lambis</i> spp.	<i>Nyale</i>	Yes	
Giant clams	<i>Nyera</i>	No	
Octopus	<i>Pweza</i>	Yes	
ECHINODERMS			
Starfish (blue)	<i>Kiti cha pweza</i>	No	
Starfish (knobbly red)	<i>Tawangwe</i>	No	
Sea urchins	<i>Ufuma</i>	No	Some species are recorded separately: <i>Diadema</i> spp. (macho); <i>Stomopneustes</i> spp. (mawe); <i>Echinothrix diadema</i> (moto); <i>Tripneustes</i> spp. and other short spine species with visible test (bodo)
Crown of thorns (COT) <i>Acanthaster planci</i>	<i>Takambe</i>	No	Included since 2004 as it can reach plague proportions and is a voracious predator of corals (CRC 2001)
Sea cucumber	<i>Jongoo</i>	Yes	
CRUSTACEANS			
Lobster	<i>Kamba</i>	Yes	

6.2.2. Status of coral reefs

In 1968, reefs adjacent to Tanga town were described as being “among the best along Tanzania’s coastline” (Ray, 1968). By 1987 however, when IUCN carried out an initial survey on nine reefs (mainly on the leeward slope), this situation had drastically changed, and coral cover of less than 20% was recorded in most areas with the leeward side of one reef (*Nyuli*) having less than 1% (Bensted-Smith 1988). Wamba, Jambe and Ulenge reefs had below 10%. Some reefs had high cover though. Very low coral diversity (20 genera cf average of 45 genera for the region) was also recorded. Reef fish and diversity were very low especially for economically important

Table 6.4. Fish species and groups that the VMT identify and count separately.

Swahili	English	Latin	Comment
Kolekole	Trevally	Carangidae	Pelagic/schooling
Chewa	Groupers	Serranidae - <i>Epinephelus</i> spp. - <i>Cephalopholis</i> spp. - <i>Plectropomus</i> spp.	Carnivores/high trophic level/high fishery value
Tembo	Snappers	Lutjanidae	
Chazanda	Mangrove jack	<i>L. Argentimaculatus</i>	
Haraki	paddletail snapper	<i>L. gibbus</i>	
Changu	Emperors	Lethrinidae	
Mleya	Grunts (sweetlips)	Haemulidae	Omnivore-carnivore/medium fishery value
Kitamba	Grunt	<i>Plectorynchus flavomaculatus</i>	
Mkundaji	Goatfish	Mullidae	
Kangu - kidogo	Parrotfish - juveniles	Scaridae	Herbivores/medium trophic level/medium fishery value; parrotfish are counted in two groups: large and small fish, which the VMT refer to as juveniles (6-15cm total length) and adults (>15cm TL). Note that for some small species of scarids, adults are categorised as juveniles using this system.
Kangu - mkubwa	Parrotfish - adults		
Kangaja	Surgeonfish	Acanthuridae	
Chafi	Rabbitfish	Siganidae	
Kipepeo	Butterflyfish	Chaetodontidae	Coral health indicators/valuable in aquarium fishery
Mwasoya	Angelfish	Pomacanthidae	
Mbono	Fusiliers	Caesionidae	Planktivores/low trophic level/low fishery value
Kikande/kidui	Triggerfish	Balistidae	Indicator of sea-urchin populations
Chorwe	Napolean/humphead wrasse	<i>Cheilinus undulatus</i>	Indicator of fish community health; proposed for inclusion by IUCN in 2004 but is not currently counted

species. The damage was attributed to dynamite fishing (Bensted Smith, 1988). These findings were Supported by work conducted by the Natural Resources Institute of the U.K. two years later who also reported coral cover of less than 20% in most areas (UNEP 1989), a value generally considered to represent coral reefs in poor condition (Wilkinson 2004).

By 1995, when TCZCDP conducted their rapid appraisal of Tanga's reefs, an estimated 12% of reefs were found to be destroyed, 64% in poor or moderate condition, and only 24% in good condition. Abundance of many fish and invertebrate species was also low (Horrill *et al.* 2000). Much of the decline in reef health was attributed to dynamite fishing, which has been a longstanding problem (see Chapter 5) as well as the almost doubling of licensed fishers since the 1970s (Beckley *et al.*, 1997). The following sections describe the changes over the course of the TCZCDP that may be related to management interventions or other events, such as coral bleaching.

6.2.2.1. Coral and other benthic cover

Analysis of trends in live coral cover in relation to management interventions is partly confounded by large scale episodic events that occurred in the region and beyond. In 1998 a major El Niño took place and the Indian Ocean was the most severely affected ocean in the world (Obura *et al.*, 2002). The resulting increase in sea temperature caused significant coral bleaching and eventual coral death on many parts of the East African coast. Tanga was no exception with live coral cover falling by 50% on all reefs due to coral bleaching in March 1998 (Horrill *et al.*, 2001). Monitoring by IMS of four reefs (Upangu, Taa, Chanjale and Kitanga) showed an average live coral cover decrease from 67% in 1997 to 12.5% in September 1999, which was attributed to the bleaching. The biggest decreases occurred on reefs with the highest original cover (Horrill *pers comm.*, Muhando and Mohammed, 2002). Despite this decline, and encouragingly, gradual recovery was seen over the next two years and by 2000 live coral cover had stabilised at pre-bleaching levels. Closed reefs (Dambwe, Maziwe, Bunju and Makome) generally recovered faster and had almost three times the density of coral recruits compared to open reefs (Horrill *et al.*, 2001).

An analysis of the full seven year dataset (1998-2004) found that coral recovery was not consistent across all reefs and did not persist beyond 2001/2, when a decline in coral cover was observed particularly on closed reefs (Othina and Samoilys 2005). Rubble also appeared to increase after 2002. During the first half of 2003 there was a coral disease outbreak in two genera *Montipora* and *Astreopora* (Obura and McClanahan *pers. comm.*). In Kenya the disease resulted in heavy mortality in these genera and complete disappearance of *Montipora* at one site (McClanahan *et al.*, 2004). Mortality was less in Tanga (McClanahan *et al.*, 2006), but this disease no doubt contributed to the drop in coral cover seen in 2003. The larger drop on closed reefs may reflect greater coverage by these two genera on the closed reefs compared with the open reefs.



Table 6.5. Average percentage live coral cover by reef, data pooled from 1998-2004. Closed reefs are in bold. Bold italics are reefs closed for one year and re-opened. Location of reef on the shelf is approximated as inner or outer. Date established refers to CMA.

% live coral cover	Reef	Inner/Outer	CMA	Date established
>50%	Makome <i>Kitanga</i>	In In	Mtang'ata	1996
40-50%	Dambwe	Out	Boza-Sange	1996
	Maziwe	Out		
	<i>Upangu</i>	In	Mtang'ata	1996
	Fungu Zinga	Out	Boza-Sange	1996
	Bunju	In	Boma-Mahandakini	2000
30-39%	Shenguwe	In	Mtang'ata	1996
	Chanjale	In		
20-29%	Kipwani	Out	Mwarongo-Sahare	1999
	Chundo/Kiroba	Out	DeepSea-Boma	2000
	Makangaja	In	Mkwaga-Sange	2000
	Kisike Mtu	In		
	Taa	In	Mtang'ata	1996
< 20%	Mwani	In	Boma-Mahandakini	2000
	Mijimile Ndogo	Out	Boza-Sange	1996
	Jambe	Out	Mwarongo-Sahare	1999
<10%	Wamba	Out	DeepSea-Boma	2000

The highest levels of live coral cover (>50% and 40-50%) were found on reefs in Mtang'ata and Boza-Sange, the two longest established CMAs, having been in place since 1996. Boza-Sange is also one of the least populated CMAs, and a correlation between human population density and coral damage was suggested by earlier data (Horrill *et al.*, 2000). Most closed reefs have higher coral cover than the open reefs (Table 6.5). Exceptions are seen in the two closed reefs of Deepsea Boma and Mwarongo-Sahare CMAs with less than 30% coral cover. But it should be noted that these CMAs are near Tanga and have the greatest number of villages and fishing pressure. At the start of the Programme, reefs off Tanga and Muheza District were of poorest quality, with about 66% of the reefs poor or destroyed in both cases (Horrill, 1999). Live coral cover is nevertheless greater on inner reefs (Othina and Samoilys 2005) suggesting that enforcement of damaging fishing methods is better closer to shore (Table 6.5).

These results reinforce the result obtained in many coral reef studies, that recovery from damage is a long process. Interestingly the two reefs that were closed for only a year are in the higher coral cover category, perhaps reflecting initial high cover. Deepsea Boma CMA had the most damaged reefs with live coral cover of <10% on its open reef, Wamba, (reported also in the 1988 IUCN survey - Bensted Smith *et al.*, 1988) and <30% live coral cover on its closed reef, Chundo/Kiroba. It is possible that reefs that have been badly damaged by dynamite fishing may never recover (Othina and Samoilys 2005). Certainly, if macro-algae colonise damaged reefs and herbivore densities are low, corals may be out-competed and unable to recolonise the reef - an ecological phase shift is said to occur (McCook 1999, Lirman 2001, Rasser and Riegl 2002).

6.2.2.2. Fishes

The 1995 rapid appraisal survey found that abundance (estimated from species rankings) of commercially important fish families (e.g. snappers, emperors, grunts, and rabbitfish) was low on 90% of the reefs (Horrill *et al.*, 2000). However, by 2000, after three years of Programme intervention, the density of commercially important benthic and schooling fish populations had increased on both open and closed reefs. Overall, densities were greater and changes were more marked on closed compared to open reefs (Horrill *et al.*, 2001). Some declines in density were observed in 1999-2000 and were attributed to incidences of poaching in 1999 and the opening of two of the closed reefs at the end of 1998. Changes varied among species: there was a slight rise in surgeonfishes on all reefs, particularly on open reefs; angelfish showed a slight overall increase on both open and closed reefs; while butterflyfish densities rose on open reefs, but remained stable on closed reefs. No triggerfish were recorded on open or closed reefs before management was implemented but in March 2000, very low numbers were counted on closed reefs (Horrill *et al.*, 2001). On the two reefs (Kitanga and Upangu) that were only closed for one year, fish densities remained the same as on the open reefs, which may have contributed to the communities' decision to retain closed reefs as closed, and not to rotate them as originally discussed.

Analysis of the full dataset for 1998-2004 also showed that, until 2003, densities of carnivores (groupers, snappers and emperors), omnivores (grunts/sweetlips and goatfish) and triggerfish were generally higher on closed reefs compared with open reefs, suggesting protection was effective (Othina and Samoily 2005). There was some evidence that herbivore (e.g. rabbitfish) density was higher in the older CMAs as was also the case for the coral health indicator species - the butterflyfish and angelfish, but this trend was not seen for other fish species. The densities of most fish groups were consistently higher on the reefs in Deepsea Boma CMA which had the lowest coral cover (see below), and low on reefs in Boma-Mahandakini CMA. Higher population densities of fishes were found on offshore reefs, particularly of carnivores and omnivores, the primary species in the hand line fishery (see Chapter 5), perhaps reflecting easier access by fishers to inshore reefs.

These results suggest that management interventions as well as large-scale ecological factors are affecting fish populations. Reefs in the south in Mkwaja-Sange CMA were distinctly different from all others (Figure 6.2) and higher populations of fishes were found on offshore reefs, particularly of carnivores and omnivores the primary species in the hand line fishery (see Chapter 5). This latter observation may reflect easier access by fishers to inshore reefs. The clustering of CMAs and reefs shows how difficult it is to tease apart management impacts from natural variation between the CMAs, such as the extent of shallow habitat, a factor shown to influence reef fish and coral biodiversity (Bellwood and Hughes 2001). However, the results indicate that reef closures are having a positive impact on certain fish groups particularly the commercially exploited species. Trends over the seven year period show that fish densities for the major groups were declining during the early years of the TCZCDP, but this trend reversed around 2000/01 when all of the seven closed reefs had been established. The closures and enforcement of fisheries regulations in the two oldest CMAs, Mtang'ata and Boza-Sange appear to have had the most positive impact, while the more recent closures have had less impact, as would be expected.

In 2003, the TCZCDP data show a dramatic drop in densities in all fish groups (Figure 6.3), representing a 5-6 fold decline. The cause of this is not known, and such declines have rarely been reported in other reef fish studies. If fishing had led to recruitment overfishing the decline would be more gradual, though the common coral trout a grouper on the Great Barrier Reef,

suffered a rapid 10-fold decline between 1996 and 1999 on the southern Great Barrier Reef, which was attributed to heavy commercial fishing which had increased by 30% over the same period (Ayling *et al.*, 2000).

The problems with inadequate replication of fish transects discussed earlier and the subsequent difficulties in analysing the data may mean the fish data are not completely reliable and this may have a bearing on the apparent dramatic decline in fish densities in 2003. The ongoing TCZCDP monitoring data through 2005-07 analysed through the Programme's Information Management System (Pabari *et al.*, 2005) show that carnivore and omnivore densities continue to be very low at 1-2 fish per 250m², and 2-3 fish per 250m², respectively. The TCZCDP Information Management System graphs also show herbivore densities in 2001/2 of 22-31 fish per 250m², only half the densities presented in the 2004 analyses (Figure 6.3b). However, both graphs show the significant decline in 2003 to densities in the order of 7-15 fish per 250m². The more recent data show herbivore densities have steadily increased since 2005 and have reached 22-23 fish per 250m² in early 2007 which is encouraging. The discrepancy in the data is no doubt related to problems with data management and changes in methods, but the relative values are probably a reasonable indication of trends.

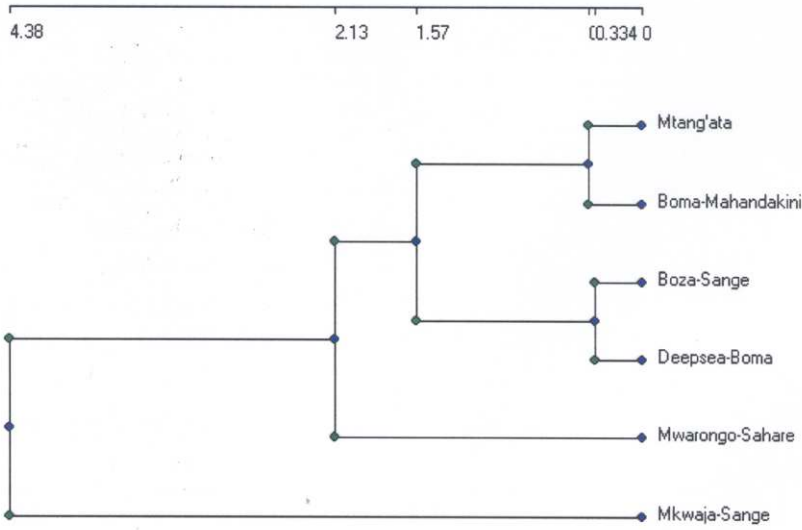
The results suggest that despite a reduction in illegal and destructive fishing and the presence of closed reefs, fish populations have suffered a large decline in Tanga Region since 2003. Natural phenomena such as poor recruitment years and/or coral health from bleaching or disease may also be contributing. Possibly the coral disease outbreak in early 2003 had some effect combined with a lag effect from the massive coral bleaching event in 1998. This is partially supported by the live coral cover which after some recovery began to decline in 2000/2001. The major reduction in herbivores is particularly worrying because they play an important role in keeping macro-algae standing crops down (McCook 1999).

An independent study by the Mombasa-based Coral Reef Conservation Project, commissioned by TCZCDP, found that fish biomass on the Tanga reefs had increased from 260 kg/ha in 1996 to 457 kg/ha in 2004 (McClanahan *et al.*, 2006). The increase was most noticeable in herbivores, including parrotfish (Scaridae) and rabbitfish (Siganidae). This is very different to the TCZCDP results for 1998-2004, where herbivore densities improved the least compared to other species groups. McClanahan *et al.*, (2006) also found a significant decline among carnivores (snappers, emperors, and grunts), which again contrasts strongly with the TCZCDP data which showed increases in this group until 2003. The discrepancies between the two studies may be partly due to McClanahan *et al.*, (2006) surveying at two points in time only (1996 and 2004) and on four reefs, three of which were open. The TCZCDP data were collected at more regular intervals and on many more reefs, including a larger number of closed reefs. McClanahan *et al.*, (2006) found that the Tanga reefs also had high fish species diversity (38-41 per 500m²), only marginally less than reefs in Kisite Marine National Park in southern Kenyan (47-51), which is very encouraging.

6.2.2.3. Mobile invertebrates

The mobile invertebrate populations have highly variable populations and several factors appear to affect their densities, including management status (closed/open reefs), reef location and CMA. Most species of mobile invertebrates showed a peak in densities around 2000/1 and have since declined though data are highly variable (Figure 6.4). In general it seems that reef closures and efforts to reduce dynamite fishing and other illegal fishing practices are not having a major impact on mobile invertebrates, although there may be some exceptions (Othina and Samoily 2005).

a: Clustering of CMAs



b: Clustering of Reefs

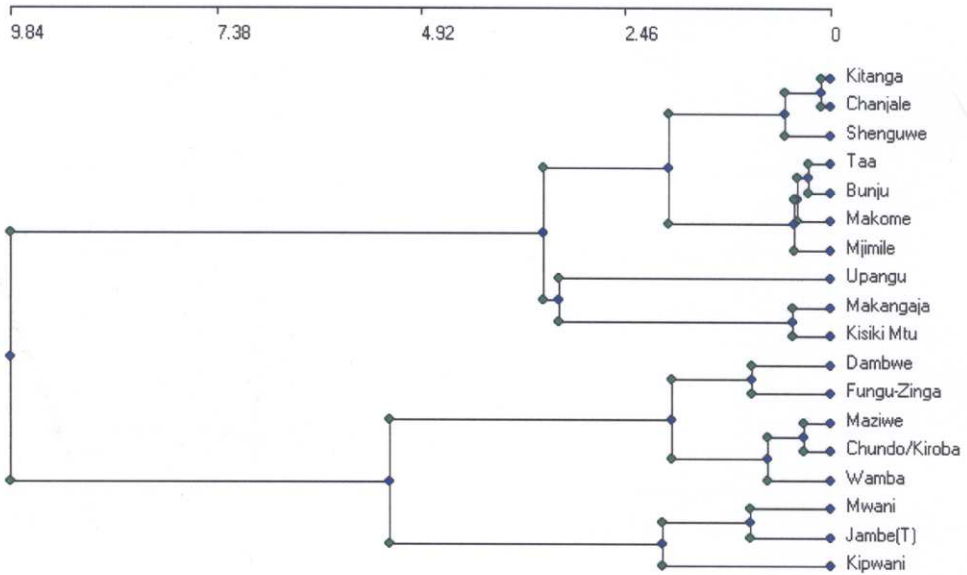
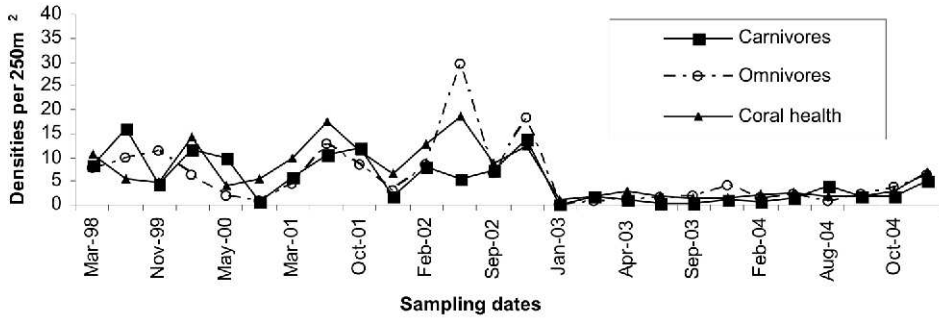
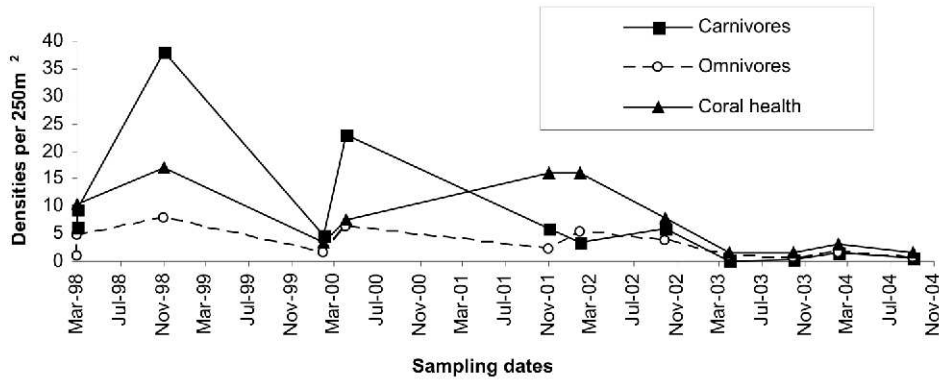


Figure 6.2. Dendrogram of fish densities, all species combined in Tanga region (from: Othina and Samoilys 2005).

(i): Reef Fish Densities (Closed)



(ii): Reef Fish Densities (Closed-Reopen)



(iii): Reef Fish Densities (Open)

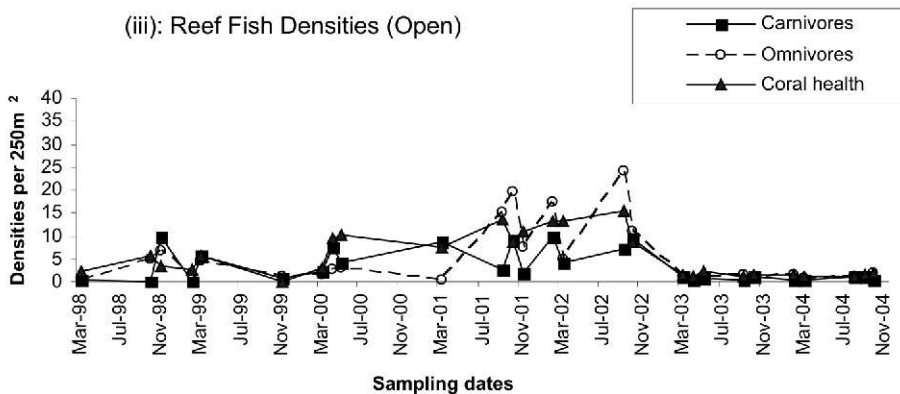


Figure 6.3a: Fish densities over time (across all CMAs) versus reef management status: Closed reefs = two closed in 1997/98, five closed in 00/01; Closed-reopened = two reefs closed in 1997 re-opened in 1998. (from: Othina and Samoilyis 2005). See Table 6.4 for explanation of fish groups. Coral health group represent butterflyfish and angelfish.

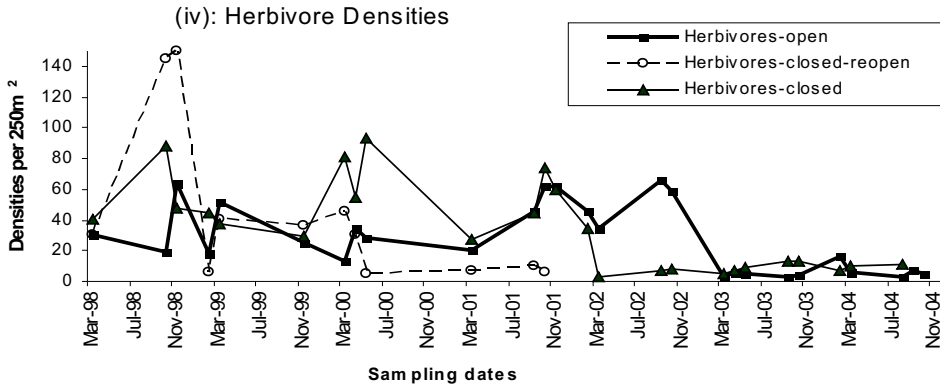


Figure 6.3b: Herbivore densities over time (across all CMAs) versus reef management status. Reef closures as for Figure 6.3a.

Sea cucumbers: Population densities of sea cucumbers showed large intra-annual variation with drops in March and peaks in November, but overall the populations have remained fairly stable since 2000 at around 0.7-1.0 per 50m² (Fig 6.4), which is encouraging. The VMT group all non-commercial with commercial species during their surveys and therefore interpretation of trends is difficult and certainly hard to compare with other studies. Densities were greatest in the two longest-established CMAs, Mtang'ata and Boza-Sange, suggesting reef closures and habitat protection from destructive fishing techniques may be having a positive impact on these species in reducing exploitation, and that



>5 years intervention is required before impacts are noticeable. However, densities were significantly lower on the two closed-reopened reefs (0.04 per 50m²) compared with the open reefs (0.05 per 50m²); and although densities on the closed reefs were higher (0.06 per 50m²), this was not statistically significant suggesting reef closure is only a weak factor (Fig. 6.4). The low overall densities are also cause for concern. Muthiga and Ndirangu (2000) found that densities in Kenya varied widely but were nevertheless much higher, ranging from 0.7 to 14/200m² (equivalent to 0.18 to 3.5/50m²), with significantly higher densities in MPAs (~12/200m²). The Tanga populations lie well at the bottom end of this density range suggesting that the reef closures may not be providing much protection.

Octopus: The reef monitoring data revealed no patterns in octopus population densities in relation to reef closures, CMAs or over time. However densities were very low (average of 0.05 per 50m²) every year (Figure 6.4). This was attributed to either inadequate sampling of these species, or to severe over-fishing (Othina and Samoilys 2005). The VMT's invertebrate survey method is not ideal for octopus which tend to be more abundant in shallower water and so may be under-estimated with transects in deeper water. Nevertheless the near zero values are worrying and may be linked to the commercial octopus fishery.



Plate 1. Lessons Learnt Book Workshop 2004: TCZCDP and IUCN Staff, past and present, at the Regional Coastal Resource Centre in Tanga. © TCZCDP.



Plate 2. Mrs Mwanshamba Nzari, Chair of the Mtang'ata Collaborative Management Area's Central Coordinating Committee. © Mussa Dengo.

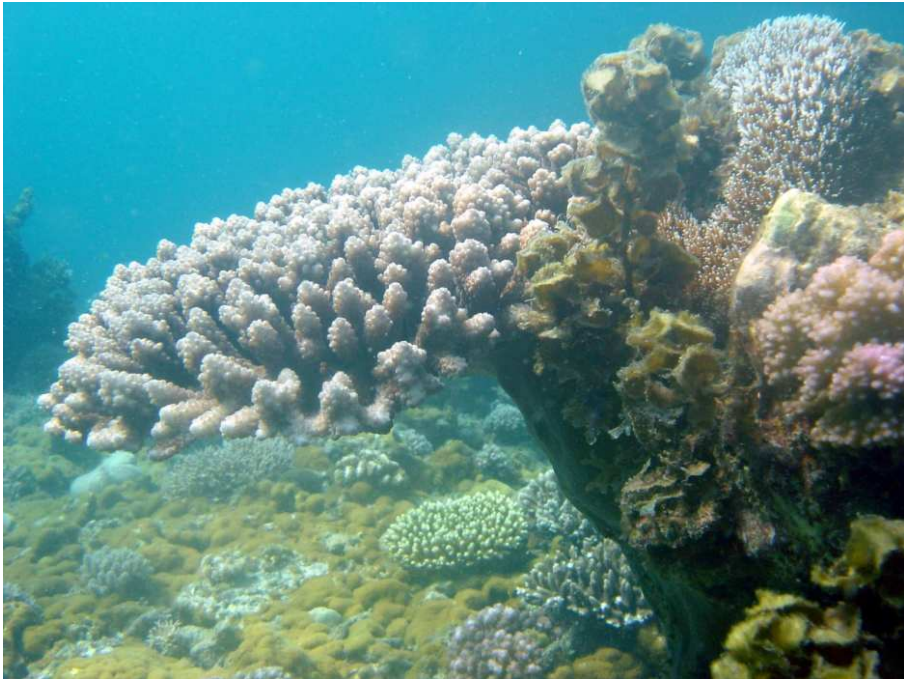


Plate 3. Fungu Zinga reef in Boza Sange Collaborative Management Area, with *Acropora* sp. and other hard corals, and *Turbinaria* sp. brown algae. © Eric Verheij.



Plate 4. Fish monitoring at Sahare landing site. © Eric Verheij.



Plate 5. Village Monitoring Team training in reef health surveys in Boza Sange Collaborative Management Area. © Melita Samoily.



Plate 6. Mangrove replanting at Chongoleani. © TCZCDP.



Plate 7. Seaweed farmers at Mchukuuni. © Eric Verheij.



Plate 8. Tanga school children competing in Marine Environment Day celebrations, Mombasa 2003. © Eric Verheij.

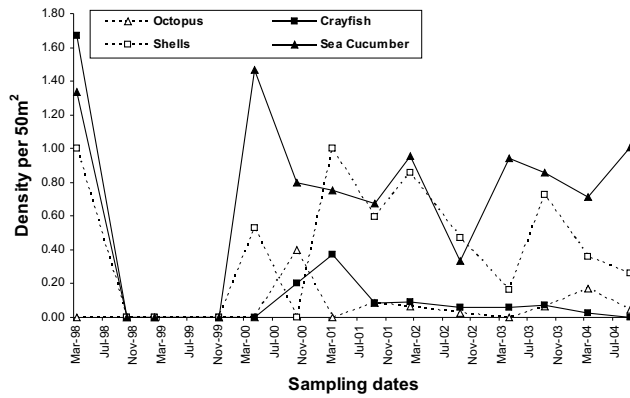


Plate 9. Hassan Kalombo discussing spawning aggregations of reef fishes in Kigombe village. © TCZCDP.

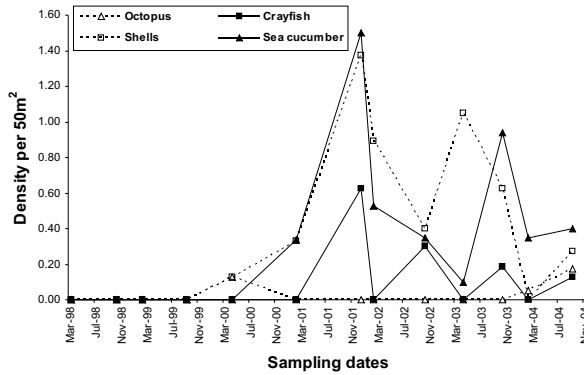


Plate 10. Hawksbill turtle at Maziwe reef. © TCZCDP.

(i) Closed reefs



(ii) Closed - Reopened reefs



(iii) Open reefs

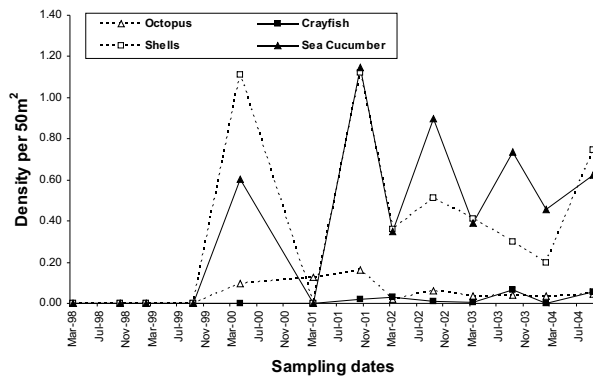


Figure 6.4: Impact of reef closures on densities of invertebrates. Note that sea cucumbers refers to a mix of commercial and non-commercial species that are not distinguished in the surveys (Source: Othina and Samoily 2005)

Lobsters: The 1995 rapid appraisal survey found low counts of lobsters especially on coastal and inner patch reefs. The subsequent analysis of reef monitoring data found that densities varied significantly between closed and open reefs and over years, with no clear relationship with to the TCZCDP interventions (Figure 6.4).

Molluscs (shells): The 1995 rapid appraisal survey found that counts of those molluscs important for subsistence (*Lambis* spp.) or conservation (*Tridacna* spp.) were also low especially on coastal and inner patch reefs. The reef health monitoring data shows that molluscs have remained relatively stable (Figure 6.4).

Non-fishery invertebrates: Horrill *et al.*, (2001) found that the density of the sea urchin *Echinometra mathaei* declined in 1999 after an initial rise, whereas that of *Diadema* increased, and that combining densities of all urchins, the overall fall was most notable on closed reefs (an approximate 50% decrease) with open reefs showing only a slight overall decrease. Verheij *et al.*, (2004) also found significant decreases in sea urchins over time, but with densities greatest on closed reefs. The more recent analysis (Othina and Samoily, 2005) found that sea urchins were more abundant on offshore reefs in the northern CMAs, which were the reefs most damaged by dynamite fishing (*pers. obs.*). Higher densities were found on open reefs (68 per 50m²) compared with closed reefs (54 per 50m²), and peaks in density were seen during the period 2000 to 2003 (Othina and Samoily 2005). Reef decline in recent years (since 2001/2, see 6.1.2.1 above) may be reflected in the increasing sea urchin densities as they appear to thrive on damaged reefs. Encouragingly though, the recent TCZCDP data show densities have dropped to around 20 per 50m² through 2005-06.

A dramatic increase in the number of Crown of Thorns starfish (COTs) was reported by the VMT in Boza Sange CMA in September-October 2004, with one reef, Mijimile Ndogo, having densities well above the plague outbreak definition level of 30 adults per hectare (Fraser *et al.*, 2000). Plague proportions of COTS are well known for damaging coral reefs (CRC 2001), although the phenomenon appears to be rare in the Indian Ocean. Villagers and the VMT decided the COTs should be removed and a clean up exercise was implemented in November 2004: 816 starfish were removed and buried on land following recommended guidelines for dealing with COT outbreaks (Fraser *et al.*, 2000). Subsequent monitoring in March/April 2005 found that COT numbers had returned to normal at this reef indicating the removal exercise had been successful.

6.3. Mangroves

Nine species of mangrove are found in Tanga Region, all of which occur in each District (Table 6.6). The ninth species, *Xylocarpus molluccensis*, known from across the Kenyan border had not been recorded in Tanzania previously but was identified by TCZCDP staff during the Programme: seeds and two trees were found near Chongoleani (Verheij, *pers. obs.*). Mangroves are used as building poles for houses, for boat making (ribs), for firewood and charcoal for home cooking, fish smoking and brine boiling for salt, for tannin, and for traditional medicines. They also provide habitat for bees which provide honey. They support rich fisheries which provide a valuable protein source and generate income for coastal communities. Mangrove forests and the varied wildlife that inhabits them offer a high potential for eco-tourism; for example, there is a proposal for an ecotourism enterprise at Tauten I. in Tanga Bay.

In 1996, at the TCZCDP Regional-level Forestry strategic planning workshop, it was recommended that the mangrove forests should be surveyed and mapped, their uses and threats document, and an assessment made of whether the adjacent local communities would be able

Table 6.6. Mangrove species found in Tanga Region

Local name	Latin name
Mchu	<i>Avicennia marina</i>
Msinzi/muia	<i>Bruguiera gymnorrhiza</i>
Mkandaa	<i>Ceriops tagal</i>
Msikundazi/mkungu	<i>Heritiera littoralis</i>
Kikandaa/mkandaa dume	<i>Lumnitzera racemosa</i>
Mkoko	<i>Rhizophora mucronata</i>
Mililana	<i>Sonneratia alba</i>
Mkomafi	<i>Xylocarpus granatum</i> <i>Xylocarpus molluccensis</i>

to undertake participatory forest management. 34 villages adjacent to mangrove forests were selected for the survey. Three priority sites: Kipumbwi, Mavovo, Mwanumbya, were selected based on the interest of the communities, the indigenous management systems in place and the fact that they were the most threatened. Two teams carried out the village profile, comprising District community extension workers and a consultant. The forest profile was carried out by the forestry officers, led by a consultant. The RAP method was used which involves measuring the ground cover % of all coastal forests, amount of regeneration, species present and which were preferred by the communities.

6.3.1. Mangrove Monitoring

Mangroves are monitored in order to compare areas under different management interventions. Permanent sampling plots were established at Kipumbwe, within what is now the KiSa collaborative management mangrove area, and have been monitored annually since 1998, using the methods introduced in the initial rapid appraisal survey. Monitoring is carried out by villagers with the help of the District Forest Officer. In 2002, the monitoring programme was expanded to other forest blocks, involving four villages in DeepSea Boma (Muheza District), and in 2003 to the Chongoleani mangrove forest in Tanga. The method used by the TCZCDP was revised in 2003 to harmonise with the National Mangrove Monitoring Programme which uses an international standard.

In each forest block a permanent sample grid is set with a line transect (10 plots of 20m each). Measurements are taken following the bearing referred to on the map. The starting point and distance between the plots is measured, marked and recorded so that the same grid is used each time. The following data are collected:

- **Tree height:** measured for all trees over 2m tall and whose crowns pass over the transect line; a graduated pole is used, with a hypsometer for trees over 5m tall.
- **Percentage crown cover:** a spherical densitometer is used; readings are taken at the mid point of each plot at four geographical points i.e. North, East, South and West of the plot centre.
- **Species diversity:** assessed by counts of species in every plot along the transect line.
- **Regenerating seedlings:** all trees less than 2m and touching the transect line are recorded, with their position and height.

At the mid point of each transect (10m) a photograph of a surveyor standing at 90° and 10m from the tape is taken which is attached to the vegetative structure form.

6.3.2. Status of mangroves

In terms of District coverage in Tanzania as a whole, Rufiji has the largest mangrove forest, Kilwa second, and Tanga-Muheza third. Pangani has a very small amount of mangrove. In the early 1990s, it was estimated that mangroves covered a total area of 111,994 ha in Tanzania (or 172,889 ha if creeks, clear-cut areas and salt pans were included) (Semesi, 1991). A survey in 2003 (Wang *et al.*, 2003) found a small increase (176 ha) in Tanga Region: 96 ha increase in Tanga/Muheza and 80 ha increase in Pangani (Table 6.7). In contrast, mangrove coverage in Rufiji, Kilwa, Kisarawe declined.

Table 6.7. Area of mangroves by District (ha); figures are not available separately for Tanga and Muheza (Source: Wang *et al.*, 2003)

	1990	2000
Tanga & Muheza	9,217	9,313
Pangani	3,799	3,879
Total TZ	109,593	108,138

The six CMAs differ considerably in the amount of mangrove that they each border:

- Boma Mahandakini: mangrove cover from Vuo, Zingibari, Moa, Ndumbani, Mayomboni to Jasini bordering Kenya to the north.
- Deepsea Boma: Chumvini, Chongoleani, Kizingani, Kibiboni, Doda, Manza, and Boma.
- Mwarongo Sahare: Mangrove covers Mtambwe, Ndumi, Mwambani Mchukuuni, Jambe island and Geza area.
- Mtang'ata: Mwarongo, Tongoni and a small strip south of Kigombe.
- Boza-Sange: along the Pangani R.
- Mkwaja-Sange: KiSa area and at southern end

The main potential threats to mangroves in Tanga Region are clearance for industrial sites, housing, agriculture, salt pans, and aquaculture. However, although the monitoring data available for analysis are scanty, there are indications that mangrove health is being maintained and in some cases is improving. Tables 6.8 and 6.9 show the results for 2001 and 2002 for two Districts, and for five blocks within the KiSa mangrove forest, the first forest to be included within a collaborative management plan (see Chapter 4). These indicate that:

- Tree height, although variable, is increasing in several cases;
- Crown cover is stable or increasing and always over 50%;
- Regeneration of seedlings shows a positive trend; and
- Number of trees over 2m tall is stable or increasing.

Table 6.8. Mangrove data collected in Pangani and Muheza Districts 1998 -2002 (there were no data for 2000 or 2003).

DISTRICT		1998	1999	2001	2002
Pangani	Tree height (m)	7.4	7.6	6.7	8.16
	Crown cover (%)	55.5	57.6	69.9	73.3
	Regeneration (ha)	0.0	0.0	0.0	0.0
	No. of trees	0.0	0.0	6.0	8.0
Muheza	Tree height (m)	0.0	0.0	4.27	4.44
	Crown cover (%)	0.0	0.0	55	58.9
	Regeneration (ha)	0.0	0.0	8.0	11.0
	No. of trees	0.0	0.0	12.0	14.0

Table 6.9 Monitoring results for five blocks in the KiSa mangrove forest (2001 -2002). Data are means and error estimates.

		Kitoipi	Kwa Omarima-sanga	Serewani	Kimunyu	Habirani
Mean height (m)	2001	4.4 +-1	7.2+-2	5.9+-1	8.2+-2	5.3+-2
	2002	5.4+-1	7.3+-2	8+-2	13.1+-1	7.04+-3
Crown cover %	2001	54.7+-13	78.6+-15	51.5+-15	86.9+-1	84.8+-2
	2002	59+-12	77.5+-15	54.9+-7	89.4+-1	84.7+-3
Trees >2m	2001	6+-3	8+-3	3.5+-1	4.2+-1	11.9+-3
	2002	6.9+-4	8.7+-4	3.6+-2	4.3+-05	16+-4
Regeneration <2m	2001	3.6+-5	1.6+-2	1.9+-3	4.1+-5	4.6+-4
	2002	5.5+-6	4.6+-6	0.7+-2	2.1+-3	5.6+-4
Species occupancy	<i>R. mucronata</i>	83%	12%			56%
	<i>C. tagal</i>	17%	18%			28%
	<i>L. racemosa</i>		12%	7%		
	<i>X. granatum</i>		38%	3%		13%
	<i>A. marina</i>		11%	90%	100%	
	<i>B. gymnorhiza</i>		2%			3%
	Non-mangrove		19%			

6.3.3. Mangrove rehabilitation

The 1995 rapid appraisal survey had concluded that declining fish stocks could in part be attributed to destruction of the mangroves. The TCZCDP thus decided in collaboration with the MMP to support mangrove rehabilitation of areas deforested for fuelwood or damaged by conversion to salt pans, in order to restore fishery productivity and to prevent shore and estuarine bank erosion.

Site assessments were undertaken of the areas to be rehabilitated, including surveying the remaining plants, density and distribution of naturally regenerating seedlings, 'mother' trees and empty spaces. Successful rehabilitation requires a good understanding of pre-existing species distribution, seedling density, substrate characteristics, geomorphology, and the

phenology of the mangrove species involved. Species for planting are selected according to zonation and succession which is related to salinity and the substrate. Planting is done by the communities at low tide and follows the natural zonation; the propagules or natural seedlings are planted in rows or plots. Some areas are rehabilitated by filling gaps or enrichment planting. After care is important to avoid mortality of seedlings; for example, in some cases some filling is necessary, or weeding of seaweeds. Depending on the growth of the mangroves, they may be pruned after two years in order to maintain optimum space for future growth. Care must be taken to avoid cattle grazing or browsing if the plantation areas are near settlements. Initially communities received cash payments for the work but this was gradually halted.

Over the period 1998-2003, a total of 425,264 seedlings were planted over an area of 202.46 ha (Table 6.10). Muheza District planted the greatest area (118 ha) and the survival rate has progressively increased to 75%. Tanga District planted 58.4 ha with a survival rate of 90%. Planting was low in Pangani District (25.7ha), with survival rate of 80%

Table 6.10. Mangrove seedling replanting and regeneration from 1998-2003, in the three Districts.

DISTRICT		1998	1999	2000	2001	2002	2003	Total
Muheza	No. planted	10,000	68,000	47,600	10,700	40,000	60,000	236,300
	Ha. replanted	5	34	24	5.3	20	30	118.3
	Survival rate %	5	45	50	70	80	75	
	Natural regen (ha)	NA	NA	NA	NA	4	0.5	4.5
Pangani	No. planted	5,000	8,140	16,000	NA	16,000	7,100	52,240
	Ha. Replanted	2.5	4.04	8	NA	8	3.2	25.74
	Survival rate %	70	85	80	NA	50	78	
	Natural regen (ha)	NA	NA	NA	NA	1.7	3.5	5.2
Tanga	No.planted	16,500	4,300	1150	15000	20,000	79,774	136,724
	Ha. Replanted	8.2	2.15	0.57	7.5	10	30	58.42
	Survival rate %	27	80	85	85	90	90	
	Natural regen. (ha)	NA	NA	NA	NA	10	1.7	11.7
Total	No. Planted							425,264
	Ha replanted							202.46
	Natural reg. (Ha)							21.4

Although a full evaluation has not been undertaken, it is thought that the rehabilitation work has increased public awareness of the importance of mangroves. The biomass along estuaries has undoubtedly increased and this will result in additional organic matter which should improve biological productivity and potentially fisheries. The new mangroves should also help to reduce erosion and stabilise the intertidal mud banks, as well as increasing habitat and breeding areas for mangrove depended species. Ultimately these new mangrove areas may become valuable for a range of human uses, including honey production (see Chapter 7). Cutting trials were undertaken in some villages in 1998-99, to try and determine the thinning levels that are appropriate for sustainable harvesting (Kabamba, 1999a), but these were not followed through.

6.4. Conclusions and Lessons Learnt

6.4.1. Coral reefs

Monitoring by fishers from the local community has been undertaken at a number of sites in East Africa (Obura *et al.*, 2002) but we know of no other reef monitoring programme in the region that has been underway for so long (nine years), and that fully justifies the term ‘long-term monitoring’. Furthermore, the village team still has the same five core fishers, which is also a major achievement, and the team is very well recognised in Tanga Region. Local communities are heard to say “*Wataalam wetu wana semaje?*”, which means “what do our experts say?”.

The analysis of the long-term data (1998 to 2004) indicate that, despite El Niño and a coral disease outbreak in 2003, the near cessation of dynamite fishing during the years of TCZCDP enforcement of fisheries regulations, combined with the reef closures, has had a positive impact, at least until around 2001/2, as seen in some recovery in reef health in terms of live coral cover and several important fish groups. However increases in live coral cover did not persist beyond 2001/2, and rubble appeared to increase after 2002. Similarly, increases in fish densities have reversed since 2003 with declining densities now evident across most fish species groups. These results are of concern and indicate that despite the TCZCDP, coral reef health may now be in decline. This has been attributed in part to increases in infringements of fisheries regulations that are not being detected by the patrols, and over-fishing as a function of increasing human population and few other livelihood options. Closed reefs must be rigorously enforced if they are to provide full protection against both natural and human related reef damage and degradation. It has been shown in a long term study of community based MPAs in the Philippines that infringements of reef closures negate positive impacts on reef fish populations (Samoilys *et al.*, 2007). Enforcement of fisheries regulations is also crucial, particularly of dynamite fishing.

Tanga’s reefs have also suffered from the large scale El Niño event in 1998, and a coral disease outbreak in 2003 which would also hold back their recovery, although there is also evidence that the reefs may have resilience to large-scale oceanographic disturbances that had considerably larger effects on other reefs in Kenya over this period, and that Tanga Region is possibly an important refuge for coral reef fauna against disturbances associated with climate change.

It is essential that the reef health monitoring programme is maintained, particularly in view of the apparent recent declines. Monitoring need not be onerous and complicated but it is vital that the design and subsequent data management and analysis are well planned and carried out regularly. The analysis of the reef fish monitoring data collected to date indicates that some further training and technical support is needed, and that regular review, calibration and analysis of data should be made a fundamental activity within the TCZCDP. A firm partnership with a scientific institution is essential; this was an objective of the TCZCDP but for a variety of reasons was not fully established although an MoU was drawn up with IMS. The Information Management System (Pabari *et al.*, 2005) that was introduced in 2005 to assist both local government and communities analyse and report on their monitoring data is helping; a review of how it is being used would be invaluable. A key challenge still is to find the financial resources and technical support for long-term monitoring, as is the case with many natural resource programmes.



6.4.2. Mangroves

It is difficult to say to what extent the TCZCDP contributed to the increase in mangrove cover (presumed to be a combined effect of natural regeneration and replanting) that has been observed in the Region, but undoubtedly the Programme reinforced the MMP's work, particularly through the support provided for environmental awareness (see Chapter 8) and enforcement. Community involvement in monitoring is also proving successful. Monitoring mangroves is considerably simpler than monitoring reefs and involves less training. However, improvements are needed in the storing of data and in its analysis, as evidenced by the lack of long-term data available for this publication. The Information Management System established by the TCZCDP in 2005 (Pabari *et al.*, 2005) lays out procedures for managing data on mangroves, and has incorporated the mangrove data into the larger database of reef and fisheries data.

CHAPTER 7: ENHANCING LIVELIHOODS

Lugazo Zuberi, Frida Urio, Trudi van Ingen and Sue Wells

7.1 Introduction

It was recognised early in the TCZCDP that the expected increase in the coastal population would make it very difficult to establish sustainable fisheries without developing other means of ensuring adequate livelihoods, food and income. It was also clear that lack of income generating opportunities was one of the main causes of overexploitation and use of destructive fishing methods. This chapter describes the work undertaken by the TCZCDP to support supplementary income generating activities for coastal communities.

During Phase I, the potential for various revenue generating activities was therefore assessed, awareness was raised about those activities that were feasible, and training was undertaken, in particular in mariculture and various agriculture techniques so that villagers and extension workers could test new activities. A Community Development Fund was also set up (Box 7.1).

Box 7.1. TCZCDP Community Development Fund

During Phase I, a Community Development Fund was established by the TCZCDP. This was divided equally between the three Districts (3.5 mill Tsh, or US\$5800 each) to be administered directly by the District Councils and to be used to provide direct material assistance in support of new and innovative economic activities that would relieve pressure on marine resources. The aim was also to build the capacity of the Districts to manage their own funds.

Two Districts gave grants to a small number of groups who had already raised some funds for their own projects; the third provided loans to a larger number of individuals and groups. Approximately Tsh 10,000,000/= (equivalent to US\$10,000) was provided to villages, including to villages other than the pilot villages. Activities supported included salt production, seaweed farming and fishing.

However, the Fund was considered to be ineffective (Kobb, 1997) and was not continued after Phase I. It was used to support on-going activities rather than new and innovative ones. There were no formal guidelines, so that each District took its own approach, with the objectives insufficiently clearly defined and poor understanding of how such a fund should be used by both disbursers and beneficiaries. With the establishment of other community development funds in Tanzania, notably the nationally managed Tanzania Social Action Fund (TASAF), experience of this approach to sustainable development is now greater and the need for training and careful mentoring is better understood.

At the end of Phase I, it was agreed that the TCZCDP should focus on mariculture and agriculture (TCZCDP, 1997). Trials continued in Phase II, but after the mid-term review in 1999, support for livelihood activities was considerably reduced as it was felt that the Programme was being over-ambitious for the size of its resources. Development of economic activities was therefore limited to supporting fishers who wanted to change to agriculture or mariculture with proven potential such as seaweed farming, and to developing a working vermin control package in one village (Tongoni), since this was a particularly important issue for many villagers. The final evaluation of Phase II considered that even these limited income generating activities were

beyond the scope of the TCZCDP, since the necessary research and development alone required an institutional base and a sustained approach that the TCZCDP could not offer. Instead, it was proposed that the Districts, with Programme support, should simply take a facilitating role. The final evaluation of Phase III recommended that the TCZCDP should again directly support livelihood activities, given the national priority of poverty reduction but ultimately it was agreed that this would be best addressed through initiatives outside the Programme, several of which were being set up.

One of the most notable livelihood projects was a 3-year US-AID funded initiative, Smallholder Empowerment and Economic Growth through Agribusiness & Association Development (SEEGAAD), which was set up in January 2003 by ACDI/VOCA¹⁵, aimed at finding profitable operations that would help to alleviate poverty in communities. Phases III and IV of the TCZCDP ran parallel with SEEGAAD which, in Tanga, made the promotion of seaweed farming its main objective. SEEGAAD has since been replaced by a new ACDI/VOCA project, Sustainable Environmental Management through Mariculture Activities (SEMMA), which is building on the earlier work.

7.2. Mariculture

The TCZCDP considered enhancement of fishery production essential to offset the excessive use and dependence on marine resources. A study by the Oceanographic Research Institute (ORI) of South Africa, commissioned by the TCZCDP, recommended that the potential for two main options should be assessed: increasing production of inshore species through mariculture; and development of the pelagic fishery, for example through using Fish Aggregating Devices (FADs)¹⁶ (Beckley *et al.*, 1997).

In the early 1990s, mariculture was a new activity in Tanzania. Given the few other economic opportunities for smallholders on the coast in Tanga Region, it was considered a strong option for alleviating poverty. An assessment of its potential was carried out in 1996 (Katz and Zuberi, 1996), commissioned by the TCZCDP, to look at any existing village-based mariculture practices, and identify sites and their suitability for culture of different species. Sixteen villages and two institutions (Pangani fishermen's training centre and Koweï prawn company) that were considered to have mariculture potential were visited. In addition to seaweed, several indigenous species with the potential for village-based extensive mariculture were identified (Table 7.1). Recommendations from the assessment included the need for training of those considering embarking on mariculture activities, and the establishment of pilot demonstration sites so that people could see what was involved before risking capital and labour on unfamiliar technology.

The results of the assessment were presented to the Regional Steering Committee and Programme staff, and also at meetings held in 52 villages (attended by 1575 people, 220 of whom were women) to raise awareness of the potential for mariculture and its economic and other benefits, such as enhancing village 'ownership' of resources and thus encouraging sustainable natural resource use. Awareness raising before the pilot activities started helped

¹⁵ACDI/VOCA was founded in 1997 when two U.S. nonprofit economic development organisations working largely in agriculture merged, the Agricultural Cooperative Development International and Volunteers in Overseas Cooperative Assistance.

¹⁶Artificial reefs were reviewed by ORI but not considered a feasible option in Tanga.

villagers to accept new plans and ideas. Villagers were also given pamphlets, explaining how they could obtain further information from the TCZCDP Regional Mariculture Adviser if they wanted to start an initiative on their own.

Table 7.1. Environments and species suitable for mariculture in Tanga Region (from Katz and Zuberi, 1996)

Habitat	Suitable activities	Sites
Highly exposed, sandy bottoms	Unsuitable for aquaculture	
Highly exposed, rocky bottoms	Lobster, FADs, Seaweeds (less so)	Mwambani, Moa, Kwale, Mkwaja, Kipumbwi
Protected, sandy/seagrass bottoms	Seaweeds, sea cucumbers, cage culture,	FADs, polyculture Kigombe, Monga, Ushongo, Buyuni, Mwambani
Muddy, brackish conditions, no flat areas	Prawns, milkfish, crab ranching, molluscs, oysters	Kimu Pangani, Chongoleani, Mwandusi, Tongoni, Mvuuni, Boma
Salt flats behind mangroves	Brine shrimp	Manza bay, Jasini, Maere

Twenty six people were selected from six villages to become local ‘mariculture specialists’ and, in 1996, attended a training course at the University of Dar es Salaam, along with extension workers and private sector representatives. An accompanying training manual on *The Farming of Marine Organisms* was made available (Mgaya and Tamatamah, 1996). This covered finfish (tilapia, milkfish, rabbitfish, mullet), prawns, crabs, lobsters, *Artemia* (brine shrimp), oysters, mussels, tropical cockle (*Anadara*), sea cucumber, and algae. Nine people (four from the TCZCDP, one from MMP, two from the Fisheries Division and three from the villages) undertook study tours to the Ngomeni prawn farm and Gazi oyster farm in Mombasa Kenya to learn about oyster and prawn farming. A Mariculture Advisory Committee was also formed composed of individuals from from different coastal sectors. This was disbanded during Phase II, as other bodies were playing a similar role.

As a result of the assessment and information gathered during training activities, the TCZCDP chose to support various aspects of the seaweed farming industry, which was already being developed, and to undertake trials for the culture of oysters, tilapia and prawns. Monitoring plans were developed for all proposed trials.

7.2.1. Seaweed farming

Seaweed farming has developed rapidly in many countries as an income-generating activity, particularly in South-east Asia as demand is high for a range of products (Crawford, 2002). Two species of seaweed are farmed in Tanzania, the strains of which were introduced from the Philippines (Box 7.2). Tanzania produces about 3% (c. 7000 mt) of the world’s supply (Ruitenbeek *et al.*, 2004). The four seaweed exporter/developer companies that operate on the mainland and in Zanzibar, the main center, provide materials and seedlings to the farmers, and buy the crop at a set price. The industry, until recently, has had very little input or assistance from the government or donors.

Box 7.2. Seaweed farming in Tanzania

Eucheuma spinosum (also known as *E. denticulatum*): This species is grown mainly in Zanzibar and is used primarily by the toothpaste industry. One strain of this species occurs naturally in Tanzania but is not as suitable for farming. Introduced to Tanzania in 1989.

Kappaphycus alvarezii (previously *E. cottonii* and still referred to as 'cottonii'); Rich in vitamins, proteins, minerals and iodine, this species is used in food, medicines, as fertilizer, soil conditioner and a source of salts. As a food it is made into salads, boiled as vegetables, mixed with various species, pickled, and cooked with coconut milk for soup thickening, pudding and sweetened jellies. It was introduced to Tanzania in about 1996.

Seaweed farming started in Tanga Region in 1992, after two Fisheries Officers had visited Zanzibar and identified its potential economic value. The company ZASCOL assisted with preliminary trials of *K. alvarezii* in the villages of Monga/Vyeru and later Ushongo. Commercial farming started in 1995 and soon spread to 35 villages, involving some 1800 farmers, of whom over 1300 were women; only about 24 villages were still not involved although several had potential as shown by a TCZCDP survey in 1997.

The TCZCDP decided to support seaweed farming in the hope that fishers would increasingly take it up and reduce their fishing effort. Since seaweed farming is directly supported by the industry, TCZCDP resources were used to improve monitoring, promote better management, reduce conflict with other users of the CMAs, and test new methods. Assistance ceased during Phase III, by which time seaweed farmers were being assisted by SEEGAAD.



7.2.1.1. Monitoring

Monitoring was carried out by the Regional Mariculture Adviser and addressed two aspects of the industry: production (quantity and value) and numbers of individuals participating. Since 2003, monitoring has been carried out by SEEGAAD (by the same person, as the Mariculture Adviser moved to this new programme) and the data shared with the TCZCDP. The seaweed developer collects export data.

Production

All of the CMAPs except Boza-Sange in Pangani have ‘increased seaweed production’ as one of their objectives (see Chapter 4); and seaweed farming takes place within Boza-Sange CMA in the villages of Kipumbwi, Sange and Ushongo. Tanga City is the main producer (6 villages involved in 2003), followed by Muheza (8 villages involved in 2003) and then Pangani (5 villages in 2003).

Production of *K. alvarezii* increased from a total of 43 mt in the Region in 1996, when monitoring started, to over 87 mt in 1999, but then declined to 7 mt in 2003 (Table 7.2 and Fig 7.1). The beach price of *K. alvarezii* is almost three times higher than that of *E. spinosum* but it is more difficult to grow. However, according to SEEGAAD, production of *K. alvarezii* in Tanzania has increased by about 40% since 2003, reaching a record level of 2,400 mt in 2004 and the average annual incomes of *K. alvarezii* producers rose by about 25%. In the cooler months (June-December), this species grows as well as *E. spinosum* but in the warm months, high water temperatures and heavy rain can cause die-offs. Its growth is thus more like an annual than a perennial crop, and a supply of seedlings has to be maintained over the warm months. SEEGAAD has been promoting a deepwater farming method used in Indonesia that reduces die-off.

E. spinosum farming started in 2000 in Tanga Region, when 7 mt were produced, and has since increased 20-fold, to over 130 mt in 2003 (Table 7.2 and Fig 7.2). *E. spinosum* is easy to grow but the market is small and is increasing at only about 3% a year, which keeps prices low; any major increase in production is likely to lower beach prices and income further.

Table 7.2. Production (metric tonnes) and values of seaweed (million Tsh) 1996-2003 (data missing for 1997)

Year	Species	Tanga		Pangani		Muheza		Total	
		Mt	Tsh	Mt	Tsh	Mt	Tsh	Mt	Tsh
1996	<i>K. alvarezii</i>	27.70	2,496	14.50	1,300	1.10	0,097	43.30	3,893
1997	<i>K. alvarezii</i>	-	-	-	-	-	-	-	-
1998	<i>K. alvarezii</i>	28.50	2,850	8.70	0,870	22.70	2,270	59.90	5,990
1999	<i>K. alvarezii</i>	42.40	5,088	12.50	1,500	32.40	3,888	87.30	10,476
2000	<i>K. alvarezii</i>	33.40	6,680	8.30	1,660	4.90	0,980	46.60	3,920
	<i>E. spinosum</i>	7.60	380	-	-	-	-	7.60	380
2001	<i>K. alvarezii</i>	5.10	1,020	7.30	1,460	9.10	1,820	21.50	4,300
	<i>E. spinosum</i>	62.70	3,135	-	-	10.10	0,505	72.80	3,640
2002	<i>K. alvarezii</i>	0.76	0,152	5.60	1,120	0.28	56	6.64	1,328

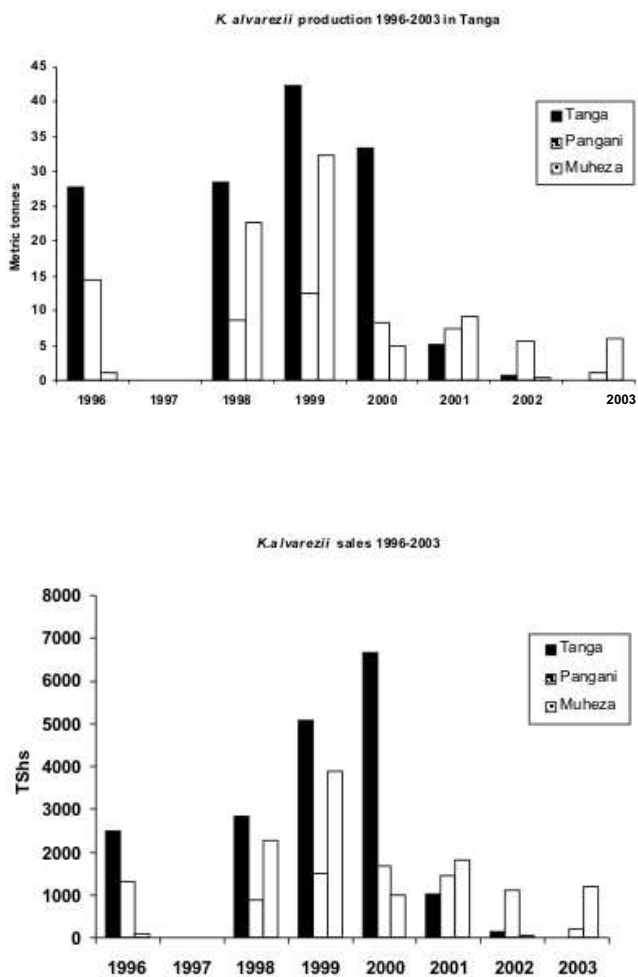


Fig 7.1. K. alvarezii production and sales in Tanga Region

At the time of TCZCDP support in the late 1990s, women seaweed farmers were unhappy about their low earnings, as the introduction of this activity has raised their awareness of commercial enterprises and the rewards they might expect for their labour. One problem with the industry is the monopoly over particular companies over each village, and also the lack of tax incentives for the exporters and developers. According to SEEGAAD, most seaweed farmers in Tanzania earn less than \$100 a year. A World Bank study (Ruitenbeek *et al.*, 2004) estimated that they make about US\$10/month, although in Tanga Region SEEGAAD reports that in some villages (e.g. Kijiru) as much as US\$ 60 per month is being made. The fact that the industry has continued and expanded indicates that the women involved clearly perceive an economic benefit, and there is evidence that they have greater financial independence (previously they only had money if their husbands gave it to them).

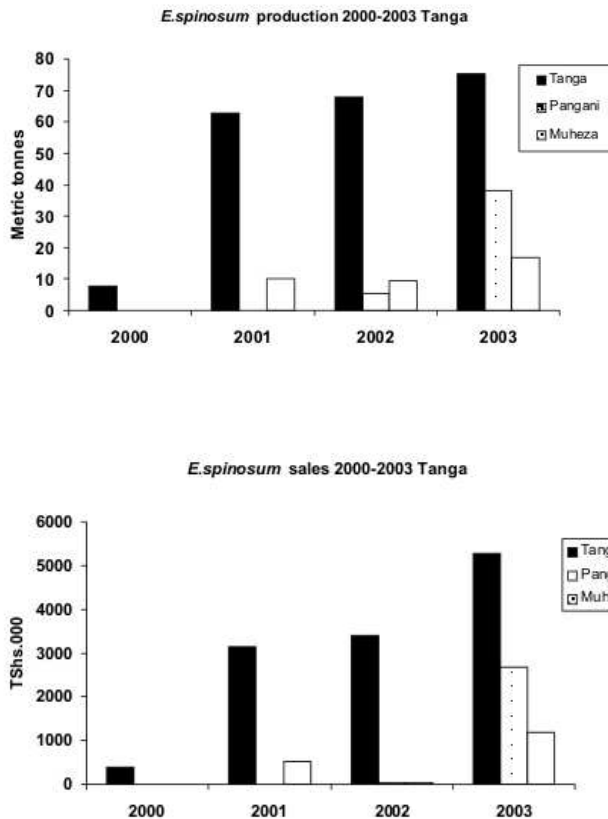


Fig 7.2. E. spinosa production and sales in Tanga Region 2000-2003

Numbers of seaweed farmers

In 1997, nearly 2000 people were involved in seaweed farming in Tanga Region but this high figure was mainly due to initial enthusiasm over the potential benefit of the new activity. By the following year, many people had dropped out and there were just over 300 seaweed farmers. A further decline in numbers occurred because of the El Niño event of 1998 which washed out many farms and caused die-off through low salinities. Numbers of farmers are said to have increased recently, as a result of assistance from SEEGAAD/SEMMA. In 1997, 80% of the farmers were in Tanga City, but the proportion in each District since then has varied; for example in 2003, Tanga had 20% and Muheza and Pangani each had 40% (Table 7.3).

Women dominate the industry, having taken it up readily as they have few other means of earning cash, and because it is similar to the collection of shells and octopus on the reef during low tide (gleaning), an activity that women also dominate. Each farmer sells the seaweed that she has grown, and uses the income as she wishes, for example for domestic needs and schooling. In some cases, a proportion of the income may be used to introduce improved production techniques. For example, the Mwambani-Kumekucha Womens Group pooled some of their revenue to co-finance the purchase of a boat (part funding was available as a donation from an NGO). The boat is used to carry the seaweed from the farms to the beach

which reduces labour, giving them more time for other activities. They also hire the boat out to other seaweed growers and thus generate additional cash income. SEEGAAD continued the TCZCDP approach of supporting communities in the adoption of such simple efficiency measures.

Table 7.3. Numbers of men and women involved in seaweed farming

District		1996	1997	1998	1999	2000	2001	2002	2003
Tanga	Men	34	218	19	12	8	15	10	10
	Women	683	1253	46	24	30	60	54	51
	Total	717	1471	65	36	38	75	64	61
Muheza	Men	18	20	39	13	15	21	27	34
	Women	229	246	182	32	73	80	76	89
	Total	247	266	221	45	88	101	103	123
Pangani	Men	10	11	2	3	2	19	37	18
	Women	101	79	22	26	16	66	150	103
	Total	111	90	24	29	18	85	187	121
Total	Men	62	249	60	28	25	55	72	62
	Women	1013	1578	250	82	119	206	280	243
	Total	1075	1826	310	110	144	261	354	305

7.2.1.2. Improved management and reduced conflict

Previously fishers tended to bring their boats into shore regardless of the presence of seaweed farms and even fished directly over the production areas. This led to conflict, which was aggravated by the rapid increase in the area under seaweed farming and the fact that the seaweed in the farms seems to attract fish, making them good fishing locations. The TCZCDP proposed zonation of the inshore coastal area to reduce the conflict. In each seaweed farming village, a five member committee was therefore set up by the village government or village assembly meeting, comprising representatives of the village government, seaweed farmers, fishers, DoFi and the seaweed developer. This was responsible for identifying suitable sites for seaweed farming. The recommendations were submitted to the village government, and approval granted in relation to the appropriateness of the site, the number of seaweed farmers already in the village, and the annual targeted production for the village. If the village government agreed with the proposal, they called a village assembly meeting for further discussion, and the site was then demarcated. If there was no agreement, another site was identified. Bylaws for enforcement of the zonation were then developed, and the minutes of the village assembly meeting circulated to nearby villages, the Ward and the District Council for information and final approval. At least four of the CMAs impose fines if seaweed farms are damaged (20,000 Tsh in Deepsea-Boma, Mtang'ata, and Mwarongo-Sahare; and 50,000 Tsh in Boma-Mahandakini). No prosecutions have yet been brought.

In 1998, over 92 acres (37 ha) were demarcated for seaweed farms in 17 villages (33 acres in Muheza, 12 acres in Pangani and 47 acres in Tanga). In most villages, all the demarcated areas have been taken up, including Ushongo, which is in the only CMA without a seaweed

production objective in its CMAP. Expansion of the industry means that all zoned areas will eventually be used. Although there are no hard data, the zoning may have helped to increase production. The seaweed farming areas may have an added benefit in providing a refuge for fish, as no fishing takes place in these areas now. Certainly, destruction of seaweed farms by fishers has been reduced, although in 2001-2002, some conflict was recorded in all Districts, and in 2001 there were cases of theft of lines and buoys (Dawson Sheppard *et al.*, 2003). Most incidences are in Tanga where there are a greater number of fishers close to seaweed farms.

7.2.1.3. Testing improved methods

The method most commonly used for seaweed farming in Tanzania, and introduced to Tanga before the TCZCDP started, is peg and line. This involves driving stakes into the sea bottom one metre apart, stretching nylon lines 5-20m long between these and attaching propagules or (seedlings) every 15-20cm. This method restricts farmers to intertidal areas only and, as more people took up seaweed farming, suitable locations started to become scarce, particularly as farmers are encouraged to use a large number of lines to boost their productivity. The TCZCDP therefore decided to test the raft method which allows farming further offshore and in areas of rocky subtidal habitat. Trials started in 1996 at Kigombe and were to some extent successful, although production rates varied. A further problem was that the bamboo needed for the rafts does not grow on the coast. It had to be brought in from upcountry which was expensive (Lugazo 1998), although it was hoped that increased revenue from the larger crop could offset the higher transportation costs. The TCZCDP encouraged villagers in Moa and Kijiru to grow bamboo, as an additional income generating activity, although initially there were problems with the theft and loss of bamboo plots to bush fires.

During Phase II, the Mariculture Adviser obtained a grant from WIOMSA, allowing larger-scale trials to be set up with a seaweed developer, Kingsway International, which provided the materials, assisted with project management and bought the harvested seaweed. Ten rafts were established at Kijiru and 10 at Moa, producing yields greater than those using the peg and line method, as the seaweed in such locations is less accessible to herbivorous fish (e.g. *Siganus* spp rabbitfish). The rafts are also used for maintaining seed sock during the rainy season when intertidal areas are subjected to fresh water, as they can be pulled off shore into more suitable salinity. Trials continued under the SEEGAAD programme and by 2003, three villages had a total of 27 bamboo rafts, and seven villages were growing bamboo.

7.2.2. Oyster farming

Apart from a small enterprise on the Kenya coast at Gazi, oyster farming is limited in East Africa. *Saccostrea cucullata*, a native species (*Chaza-kokoni*) that grows attached to mangrove roots and rocky substrates and that is commercially cultivated in other parts of the Indian Ocean and Western Pacific, is nevertheless a suitable species. The TCZCDP carried out oyster farming trials with this species in 1997 and 1998 to test feasibility in terms of growth and survivorship, management requirements and costs, potential markets and overall profitability, as well as gender applicability and environmental impact. The trials were undertaken by a group of 23 women at Mwandusi village in Muheza District, who made a study visit to Gazi oyster farm in Kenya in 1998. The women, with the assistance of TCZCDP staff, were responsible for the daily management of the oysters and the monitoring of settlement, growth and mortality; they found the work appropriate. Technically, the oysters were easy to grow (using the rack system with tiles) and growth and mortality rates were similar to those found in Kenya.

The trials were stopped in 1998 for several reasons. There were high mortalities in 1998 due to heavy rains, and growth was relatively slow (compared with seaweed), oysters taking two years to reach marketable size. More serious was the marketing problem. There was no known market for oysters in or near Tanga, and the trials were initiated with the expectation that hotels on the Kenyan coast would provide a demand. However, lack of refrigerated vans and the high cost that would have been incurred to obtain these precluded sales in Kenya. It was hoped that the marketing problem could be resolved and that culture could be resumed, and indeed, SPL is now exporting oysters from Tanga, although their provenance is not known.

7.2.3. Tilapia cage culture

There is a large demand for tilapia, and milkfish, both within and outside the country. Tilapia trials were therefore carried out in 1998 at Mvuuni, following the preparation of a proposal by an IUCN Technical Adviser and a study visit to Bamburi fish farm in Kenya (Peet, 1998a). The anchors and ropes were stolen at an early stage and so the trial was moved to Kipumbwi, which had better security. Four net cages were set up and fingerlings were imported from Bamburi fish farm in Mombasa. A buyer was identified at the start to avoid the marketing problem encountered during the oyster culture trials. An EIA was also undertaken and a monitoring programme designed. Unfortunately, the fingerlings died shortly after introduction because the netting had not been adequately cleaned. This emphasised the importance of both capacity building (e.g. training on cage management) and technical oversight, to ensure that those involved fully understand the procedures involved (Peet, 1999a,b). The trials were not continued as by this stage the focus of the TCZCDP had moved away from revenue generating activities. Recently however, the Sustainable Coastal Communities and Ecosystems (SUCCESS) programme, run by CRC, WIOMSA, the Hawaii University of Hilo, and IMS has established pilot sites for milkfish farming in several places in Tanzania.

7.2.4. Other mariculture activities

Crab culture: This activity is proving successful in Kenya and elsewhere in Tanzania, such as the Rufiji Delta, and a good market is developing. A proposal for crab culture was developed in 1998 by the TCZCDP (Peet, 1998b) and a site was identified in the KiSa mangrove forest in Kipumbwi adjacent to the fish cage site. Equipment was procured with assistance from the Kenya Marine and Fisheries Research Institute (KMFRI). However, after the Phase II Mid-term Review, when it was recommended that further mariculture activities should not be attempted directly, this trial was stopped.

Prawn culture: It was proposed that a prawn farming trial should be undertaken at Koweï prawn company (a small farm of 4.66 ha) in Manza Bay, with TCZCDP assisting with monitoring. The selected location was said to be a Zone 1 mangrove forest (i.e. protected) and permission was refused, although it was also reported that the site was a saline flat. SEEGAAD also looked at the potential for prawn farming in Tanga Region, and concluded that it might be profitable using salt ponds in the rainy season when there is no salt production. At present, the shortage of post-larval prawns preclude this happening, but a privately owned hatchery has been established on Mafia Island, and may be able to supply the required juvenile prawns in the future.

Lobster attracting devices: These were briefly considered for installation at Kigombe, but this idea was not followed through by the TCZCDP. SEEGAAD reportedly undertook some trials.

7.3. Agriculture

The agriculture component aimed to reduce the pressure on marine resources by improving production and encouraging fishers to move into this sector. A first step was to review existing farming practices which involved the 1994 socio-economic survey (Gorman, 1995), an assessment in the pilot villages of Mwambani/Mchukuuni, Kigombe and Kipumbwi in June, 1998 (Urio, 1998a), and a consultancy carried out in November 1998 (de Villiers, 1998b).

Agriculture is the second most important activity after fishing, involving 10-37% of households in coastal villages in 1994 (Gorman, 1995). Only land planted with permanent trees, such as coconuts, or with buildings on it, can be inherited. Those with no inherited land can request land from the village government but may only use it for growing food crops.

There are two types of agriculture: subsistence farming and cash crops. The majority of farmers (55-80%) are women, compared with fishing where men predominate, and women carry out most of the subsistence farming, particularly growing rice. Subsistence farming includes rice, maize, cassava, and other produce for local consumption (Table 7.4). Very few households are self-sufficient for food; of the 43 households interviewed in 1994, only one was self-sufficient, 10 did no farming at all, and the remainder were able to produce enough food for only 4-5 months (Gorman 1995).

Table 7.4. Crops grown in the three villages assessed in 1998 (acres); data from TCZCDP files.

	Mwambani/ Mchukuuni	Kigombe	Kipumbwi
Coconut	160.0	112.0	283.5
Cashew		5.0	376.0
Rice	30.0	33.0	121.8
Maize	20.0	10.0	48.0
Cassava	50.0		32.0
Bananas	15.0		15.6
Sweet Potatoes	10.0		0.5
Fruits	9.0		4.8
Pulses			2.0
Vegetables			1.0

Men are primarily involved in cash cropping, the two main crops being coconuts and cashews. Although suited to the soils, these are both low value crops and tend to be managed with minimal or zero input, efforts focusing on harvesting only. Coconuts are grown in all villages, and there is a stable marketing system, with the villages serviced by traders. Coconuts provide income throughout the year but, with increasing subdivision of land through the inheritance system, fewer individuals have sufficient trees to make the crop economically attractive; theft is also a major problem and production is very variable. Despite this, coconut plantations are very important as they are central to the land inheritance system, and the trees have multiple uses and provide a regular income from local sales (de Villiers, 1998b).

Cashew nuts are sold to companies in Tanga for export, but Tanga Region produces only about 3% of the country's exports. The Tanga crop is only of importance if there is a shortfall in the main cashew producing regions of Lindi and Mtwara, making cashew nut trading an uncertain income generating activity with variable prices. In 1994 when the TCZCDP was starting, prices were increasing and cashew farmers were investing more time in this crop (de Villiers, 1998b).

Bananas are an important source of income in most villages and are traded locally. In 1994, some locally grown fruit was being sold to a company (Tan Dan Ltd) to make jam for export, but fruit and vegetables were minor crops only, as the nearby Usambaras have a better climate and soils for such produce and dominate the market. Cattle and goats are kept in all villages and there is local demand for milk in the towns although less so in the villages. Pasture is plentiful apart from in the dry season, and zero-grazing of cows is also widely practiced (de Villiers, 1998b).

Despite the economic importance of farming, villagers see fishing as a more reliable way of earning an income and feeding the family. Agricultural production is low for several reasons, and its risky nature means that it is restricted to wealthier members of the community (de Villiers 1998a and b). The main problems are:

- Damage to crops by vermin, principally wild pigs and vervet monkeys, as a result of adjacent bush, particularly in areas where land remains uncultivated.
- Shortage of suitable land, although few villagers complained about this. Previously most of the coast was bush that villagers could clear for farming as required, but the sisal estates have taken this over in many places. Villages that are particularly short of land as a result of this include Ushongo, Kipumbwi, Kigombe, and Mkaja (Gorman, 1995).
- Poor, sandy soils with low nutrient content and variable rooting depth, and seasonal flooding in low lying areas alternating with drought (de Villiers, 1998a; GTZ, 1976), all of which cause variable yields.
- Lack of fertilisers or other inputs to increase production as they are too expensive for villagers and not always readily available.
- Cultivation mainly by hand-hoe (jembe), since agricultural machinery, such as tractors, is not readily available.
- Prices for produce so low that they tend not to cover costs; this is one reason, for example, why farmers often abandon their cashew nut trees.

It was nevertheless considered useful to look at the suitability of agriculture as an alternative to fishing and mangrove exploitation. Following the assessments and information gathering, support for agriculture activities started in Phase II, and an Agriculture Adviser was recruited. The six Phase II pilot villages took part: Kipumbwi and Ushongo in Pangani; Tongoni and Mwambani/Mchukuuni in Tanga; and Kigombe and Moa in Muheza. Following training (see below), the Adviser and District linkages assessed current farming and vermin control practices in the pilot villages and identified potential sites for horticulture (all three pilot villages), agro-forestry (Mwambani and Kipumbwi) and livestock trials (no suitable areas found). In late 1998 a consultant was contracted to work with District staff and advise on strategies for vermin control measures and the potential for agricultural development. Recommendations on practicing organic farming and home gardens, and advice on simple monitoring techniques were provided (de Villiers 1998b).

The main agricultural activities considered to be of potential benefit were:

- Organic farming and horticulture, given the demand for vegetables in the villages
- Introducing methods to control crop damage by vermin
- Agro-forestry.

The training and trials for each of these are described below. Dairy farming trials were planned for at least one village in each District but were not implemented as the targeted areas were prone to tsetse flies. Agriculture was one of the shorter components of the TCZCDP and support ended in April 1999, following the Phase II mid-term review which recommended greater focus on marine issues.

7.3.1. Horticulture and organic farming

The Regional Agriculture Adviser and three District staff attended an organic farming training course in Kenya in 1998 and subsequently trained four extension workers and a large number of farmers. Farmers and ex-fishers were given training in new farming systems, best practices and organic methods, and information on these was provided to villagers. Organic farming was emphasized as, if adopted, this would reduce threats to the coastal environment from chemical pollutants, soil erosion and run-off. Information was provided to farmers on a quarterly basis, depending on the prevailing activity in the farms, and included:

- **best farming practices** e.g. land preparation, seed selection and preparation, spacing and planting
- **inputs** e.g. availability and prices of fertilisers
- **markets** i.e. locations identified for selling produce
- **storage** i.e. importance of storage, types of crops that can be stored, different types of storage chemicals, storage structures, control of storage pests.

In 1998, women's groups in Mchukuuni, Tongoni, Kipumbwi, Ushongo and Kigombe were trained to carry out trials to determine whether it is possible to grow not only enough for their own needs, but also surplus to sell for cash. Training in organic farming was given to extension workers and village farmers from the pilot villages at the Muheza training center and during an Arusha study tour. In total, some 200-300 villagers (both men and women) were trained. A further 136 villagers from Tongoni and Ushongo were trained in improved cassava production.

Two groups in Mwambani/Mchukuuni, three groups in Kigombe, and one group in Kipumbwi (in total about 40 people of which over 90% were women) were set up, and given grants to grow vegetables including amaranths, okra, sweet pepper, eggplant, swiss chard, and tomatoes. The farmers used both conventional and organic farming practices, with more emphasis on the latter. Techniques used included double-digging of beds, using compost as fertiliser, establishing raised seedbeds for seedlings, and making natural preparations to combat pests and diseases. The produce was sold and the groups earned between 20,000 and 30,000 Tsh. In 1999, after training, a further 18 people in Tongoni and 11 in Ushongo were identified to start organic vegetable production. After the mid-term review for Phase II, existing organic vegetable trials were continued, but no new ones were initiated. Lack of Programme support meant that the organic farming trials were not evaluated in terms of sales and quantities, nor in their effectiveness as a poverty reduction strategy for coastal communities.

7.3.2. Methods to control vermin

Crop losses from vermin, principally wild pigs, *Sus scrofa*, and vervet monkeys, *Cercopithecus pygerythrus*, and to a lesser extent birds, are a major constraint to production and are compounded by theft; losses may approach 100% in unguarded crops. Prevention of crop loss involves a large time investment, and families may even move on to their farms seasonally to protect the crops. Cassava production has been abandoned in many villages as a result of crop losses, and rice cultivation is often preferred as it is a seasonal crop and less time is needed to guard it. Before the TCZCDP started, vermin control had been attempted through co-operative hunting, and some village by-laws had been enacted requiring farmers to remove bush from agricultural land to reduce the habitat available for vermin. Fines of 10,000 Tsh were imposed in some cases for non-compliance but this was having little effect (de Villiers, 1998a; Urio, 1998b).

The different control methods in use, such as seeking out vermin and killing them, block farming (see below), 24 hour guarding, setting traps, growing hedges of *Dovyalis* spp. (a thorny species that deters vermin), setting bait, and digging trenches, were assessed through a consultancy (De Villiers 1998a). Pigs are actively hunted for their meat, particularly by the Makonde people who have settled in some parts of the coastal area. Training on the more successful methods was given to some 20 villagers in Ushongo and about 30 in Tongoni by local experts. There was also a study tour to Pangani Prison where trenches are used to combat wild pigs. It was suggested that a range of control measures should be tested, and a package was developed to describe the measures to be used in each of the pilot villages.

Block farming has been carried out in Tanga Region for sometime and is particularly effective. It involves zoning the land and concentrating all farming in the most suitable area, so that individual farmers cultivate their crops adjacent to each other, without large areas of bush between them. This eliminates areas for vermin to live within the farmed area, reduces the boundary between vermin-free and other land, and makes it easier to exclude cattle and goats and enforce by-laws. Each farmer has a strategy for minimizing vermin damage, and the threat to any one individual is reduced and crops can be cultivated without the need for constant guarding. Farmers in the sub-village of Migombani in Tongoni already used block farming and were encouraged to continue. Hedges were tested in Migombani and Putini hamlets in Tongoni, and were successful (they were still present in 2005).

Crop losses were assessed in 1999 by asking farmers to estimate perceived % loss (de Villiers, 1998a). This indicated a significant reduction in crop loss; in 1998 an average of 42% of maize, rice and cassava was lost to vermin and theft, compared with only 36.3% in 1999 (Table 7.5). Loss of coconuts, which is entirely due to theft, was even more remarkable, declining from 60% in 1998 to 23.7% in 1999. Despite this, the Phase II mid-term review recommended that vermin control should focus on one village only. Efforts were therefore concentrated in Tongoni (Urio, 2000a), and some support is still provided to this village by the Tanga City Agriculture Department. Ushongo and Moa villages continued the vermin control efforts that had been initiated with minimal Programme support, and Moa villagers were trained by Tongoni villagers in vermin control and made a study tour to Tongoni.

Table 7.5. Comparison of % crop loss data between 1998 and 1999 (TCZCDP data).

	Maize	Rice	Cassava	Average
Number of farmers	58	36	25	
1998				
% lost to pigs	35	23	34	
% lost to monkeys	13	0	4	
% lost to birds	3	0	2	
% lost to theft	6	0	9	
Total crop loss	56	23	49	42.6
1999				
% lost to pigs	16.7	14.3	20.1	
% lost to monkeys	6.5	6.5	1.1	
% lost to birds	0.6	7.1	0	
% lost to theft	2.3	2.0	1.7	
Total crop loss	26.1	29.9	22.9	36.3

7.3.3. Agroforestry and wood lots

The Regional Agricultural Adviser visited two agriculture projects in the region: the Handeni Integrated Agroforestry Project (HIAP) and the Soil Erosion Control and Agroforestry Project (SECAP) based in Lushoto. HIAP aims to strengthen communities in Southwest Handeni District in managing their natural resources in a sustainable way, and has shifted its emphasis from participation to more responsible ownership of resources. SECAP aims to increase productivity and income of small scale farmers in the West Usambaras while slowing down degradation of natural resources. It was proposed that agroforestry (i.e. growing fruit trees with forestry crops to improve soil fertility) should be tried in at least two villages (Urio, 1998c).

In 1998, a number of farmers and extension workers were trained in agroforestry. Training in setting up tree nurseries was provided to four villagers in Mwambani, Kigombe and Kipumbwi, and a further six villagers in Mwambani were trained by another villager who had been trained earlier in Morogoro. Tree nurseries were established in Mwambani and Kipumbwi, the latter by a group of 30 farmers (17M, 13W) with 15 school children. A total of 1479 seedlings of *Khaya nyasika*, a native hard wood species were planted in Kipumbwi and survivorship was 83%. As with other livelihood activities, the TCZCDP did not continue its support after the Phase II mid-term review, but some of the nurseries are still functioning (Wells, *personal observation*, 2004).

During Phase I and II, woodlots for timber and fuel were established at Kigombe using *Khaya* and *Cassia*, but were later abandoned because of theft. Two woodlot agreements in Kigombe (one for women and one for men) were negotiated and approved by users and the village governments. These describe the roles of the women groups, the village government, the District and TCZCDP.

Bamboo was grown at Tongoni 1997/98 and 1999-2000 for FADs (see below) and seaweed farming rafts (see above), with a survivorship of 65% (Kabamba, 1999). Nine to ten bamboo stands still exist but are not being used. In Kigombe 1.5 ha was planted with 54 bamboo cuttings as a trial, and some trials were also undertaken in Moa and Kijiru. Several of the woodlots grew well but were destroyed by bushfire during the second half of Phase II. Interest in growing bamboo has re-surfaced with the recent demand for bamboo for seaweed farming rafts (section 7.1.1).

7.4. Other Economic Activities

7.4.1. Fish aggregating devices (FADS)

Fish aggregating devices (FADs), made of ropes, floats and other floating objects are designed and located to attract tuna and other pelagic fishes, and so enable fishers to increase their catches. In Tanga, few fishers make use of offshore fishery resources, but the ORI consultancy (Beckley *et al.*, 1997) suggested that a trial would be worthwhile. FADs were established at Kigombe and Kipumbwi 1998, using the bamboo that was being grown for the seaweed farming. However the venture was not successful as the nylon ropes used to tie the bamboo together was stolen by other fishers, possibly because they feared that successful FADs would lead to greater pressure against dynamite fishing and other illegal practices. In 2003, a Tanzanian consultancy, Samaki Consultants, proposed resuscitating the idea. This was not pursued as it is not known whether the pelagic stocks targeted could support such a fishery on a sustainable basis.

7.4.2. Tourism

Tourism has been slow to develop because of lack of access, but is now increasing and the national Tourism Master Plan identifies Tanga Region as part of an expanded 'Northern Circuit' for tourists, adding the coast to the already popular inland areas around Arusha. When the TCZCDP started there were about six hotels in Tanga City, catering more for business travellers than tourists. There were no tourist hotels to the north, but tourism was just starting to the south with about three small lodges operating at Kigombe and in Pangani, mainly with foreign investors and for the sport fishing market (Gorman, 1995). By 2005, there were nine hotels in the Pangani area alone, a growth in hotels in Tanga City and others being refurbished, and a number of operators providing activities such as diving and snorkelling.



The TCZCDP did not actively address tourism because of the low visitation rates, but one hotel south of Pangani (Tides) became involved in Programme activities. It regularly takes visitors to Maziwe I. Marine Reserve and assisted by collecting fees for the MPRU and trying to use local boats and personnel as much as possible. Tides Hotel subsequently represented the tourism industry on the TCCF. The TCZCDP ran parallel with the Pangani Cultural Tourism

Programme, which involved the training of villagers to provide community led tours, the proceeds of which were split between the guides, the administrative costs of running this programme and a development project identified by the community.

7.4.3. Salt production

Two types of salt production, solar and boiling, take place in Tanga Region. Salt boiling is the traditional method and was popular in many villages because fuel was easily obtained from the forests and mangroves, but this industry is in decline. In 1987 there were 1313 pans in Tanga Region, producing some 24,750 tonnes of salt, but by 1993 only 363 boiling pans were in operation. With improved enforcement of forestry legislation and the establishment of mangrove conservation committees in the villages, salt boiling had become less viable (Gorman, 1995): by 1997, only 79 boiling pans were in operation and by 2004, only nine.

Solar salt pans are mostly owned by private individuals who live in the towns, as the initial set-up costs are higher than most villagers can afford. There is increasing demand for solar produced salt as this produces industrial salt (containing iodine), and does not use mangrove trees; in 1987 there were 11 pans in Tanga Region and this had increased to 42 by 1995, covering 1209 ha. This figure included four village enterprises, initiated by an International Labour Organisation supported project that led to the development of an NGO, the Tanga Salt Processing Organisation. However, by 2006, production had dropped with only 27 solar salt pans in operation (17 in Muheza, 9 in Tanga) and only 60 ha in use; this decline is said to be due to high rainfall and high tides and storm surges that have damaged the pans and increased maintenance costs for the owners.

The TCZCDP considered salt production as a livelihood option in Phase I. A generator and pump were provided for salt production in Vuo village in Muheza through the Community Development Fund (Box 7.1) but it was subsequently felt that this was contributing to the destruction of mangroves and loss of bird habitat. Salt producers are now represented on the TCCF, and there is further scope for assessing how this activity can contribute to the sustainable development of the coast of Tanga Region.

7.4.4. Honey production

Honey production is a major activity for rural communities in Tanzania, and the sector generates an estimated US\$ 1.7 million each year and employs about two million people. Given the considerable potential for expansion, especially for communities living close to forests and mangroves, many development projects are promoting its uptake, supported by the 1998 National Beekeeping Policy (Mwakatobe and Mlingwa, 2005). Honey production was not initially an area of support for the TCZCDP, but with the success of the collaborative mangrove management plans and the experience of honey projects elsewhere, support was provided to the villagers of Chongoleani, in Phase III, to install beehives; the TCZCDP provided two of the ten beehives, and the village the rest. The MMP is helping to determine markets.



7.5 Conclusions and Lessons Learnt

Typical of those in many developing countries, coastal communities in Tanga Region have very diverse sources of income, with fishing and agriculture predominating; few communities depend on marine resources alone, and agriculture is usually important even if it is a small component (Crawford, 2002; Ireland *et al.*, 2004; Whittingham *et al.*, 2003). This diversity is vitally important as it provides food security in case of the catastrophic collapse of any one source.

The TCZCDP clearly demonstrated that some relatively simple techniques and approaches could be successful in enhancing coastal livelihoods, providing adequate training and support is provided. The training and awareness raising undertaken during the Programme contributed to the willingness of communities to test new activities when subsequent programmes were initiated (see Chapter 8). Although the skills gained and ideas tested were not all used in the TCZCDP itself, projects such as SEEGAAD and SEMMA were able to build on them, and to use the trained staff, most notably the Regional Advisers for Mariculture and Agriculture, both of whom moved on to these new projects.

7.5.1. Mariculture

The main achievements of the TCZCDP as identified at the Lessons Learnt workshop in February 2004 were:

- 1) Demonstration through the initial assessment, of considerable potential for mariculture in Tanga Region, as well as identification of suitable sites and species- information that could subsequently be used by the Districts;
- 2) Creation of awareness among communities and the Districts of the potential for mariculture activities. An estimated 1575 people, including 220 women received training, and several communities acquired specific skills; over 20 individuals received training to the level that they could train others and pass on their experience;
- 3) Development of a preliminary knowledge base as a result of the trials with different species;
- 4) Improvement of the seaweed farming industry.

The TCZCDP was thus an early contributor to Tanzania's rapid growth and interest in aquaculture. As in the rest of Sub-Saharan Africa (Muir *et al.*, 2005), mariculture is now seen as a feasible option for helping poor village communities, and is exempt from taxes in order to encourage its uptake. *Guidelines for Mariculture Investors* have been produced by TCMP, with the TCZCDP playing an active role in their development, in particular ensuring that they emphasise the role of communities and sound environmental practices. TCZCDP has been represented in the TCMP Mariculture Working Group since 1998.

Many species are now being tested and developed in Tanzania, building in part on the early experience of the TCZCDP. Market assessments by SEEGAAD in 2005 found that mud crab cage culture, lobster sheltering and prawn farming, all considered as options by the TCZCDP, are of particular potential for smallholder associations given the high demand both locally and also for the export market. SEEGAAD and the subsequent SEMMA project thus continued the work of TCZCDP in helping communities develop mariculture enterprises, including registering business-oriented associations and business skills training. The Sustainable Coastal Communities and Ecosystems (SUCCESS) programme currently being undertaken by CRC, the Hawaii University of Hilo and IMS, with funding from WIOMSA, is also piloting aquaculture activities with milkfish, shellfish and pearl oysters *Pinctada margaritifera* as well as furthering research on seaweed farming.

7.5.2. Seaweed farming

The successful introduction of privatized seaweed farming to local communities over 15 years ago in Tanzania has shown that new activities can be adopted by coastal communities and flourish, providing an important source of income. Seaweed farming has been particularly successful because there is a ready market; investment costs are low as all the farming materials are provided by the developers; the technology and methods are simple; and it is particularly suited to women who traditionally work in intertidal areas¹⁷. Low returns initially led to some farmers stopping, but it now seems to be as successful as it has proved in countries such as the Philippines and Indonesia. At the time the TCZCDP started, the potential importance of this was not fully recognised, but it is now the most successful mariculture enterprise in the Region.

Although the TCZCDP was not responsible for the introduction of seaweed farming or the increase in production, both of which were largely due to the involvement of private companies, it has played a widely recognised role in the success of this industry. It helped to improve the quality of the product by promoting the concept of using best practices, and reduced conflict between seaweed farmers and fishers by establishing a zonation system that was subsequently supported by SEEGAD. Seaweed farmers and the buying company are now represented on the TCCF and so issues that arise can be discussed, and the farmers themselves are generally represented on the VEMCs. Seaweed production is a prime example of how a project (the TCZCDP) can support the early stages of a development activity for which support can then be taken on through other donors and programmes organizations (i.e. SEEGAAD and SEMMA).

TCZCDP experience was also used in the development of the national Seaweed Development Strategic Plan (SDPSP), which was a collaborative effort between the government, the industry, scientists and donor-funded projects, and was approved in July 2005. It provides a framework for the expansion and sustainable management of seaweed production in Tanzania (URT/MNRT, 2005).

7.5.3. Agriculture

Although the agriculture component of the TCZCDP was in place for a relatively short period of time, and a full assessment of it has not been undertaken, several achievements were identified in the 2004 Lessons Learnt workshop:

- 1) Provision of a good baseline for future work, through the Phase I agriculture assessment;
- 2) Training of some 300 villagers and District staff, who improved their farming skills, and were made aware of the benefits of organic farming techniques and vermin control measures;
- 3) Demonstration of successful vermin control methods (principally block farming and hedges) in Tongoni village, resulting in the recommendation that each village should set aside an area of land for annual crops, with the necessary regulations to maintain it, to allow poorer villagers to combine farming with their marine activities; this recommendation was not followed up through the TCZCDP, but some interest in this by the local government has been reported;
- 4) Demonstration of organic farming and vegetable growing as successful activities, with some families benefiting from the cash generated.

¹⁷ An additional reason why women are willing to take up seaweed farming is because they are used to carrying loads on their heads and thus able to transport the heavy, wet, harvest of seaweed back to shore from the farming areas; men do not have this skill!

The lack of sustainability of the agriculture activities, except in Tongoni, suggests that a longer period of technical support was required. The shift in Programme focus also meant the monitoring of the acceptance and success of these activities was poor although a simple monitoring programme was recommended by de Villiers (1998b). Closer involvement of the agriculture sector, and particularly agricultural officers in the development of this component of the Programme might have helped to ensure sustainability of activities once the TCZCDP itself had to withdraw direct support. There has been a long and effective tradition of agricultural extension workers providing advice and support to farmers in Tanga Region¹⁸ as in the rest of Tanzania, and this was perhaps not sufficiently recognised by the TCZCDP.

7.5.4 Considerations for the future

The issue of alternative livelihoods is still mentioned by communities during meetings, and is no doubt why the Phase III evaluation recommended the issue be re-considered by the TCZCDP, and why at the Lessons Learnt workshop in 2005 it was recommended that income generating options should be looked at again. The importance of market surveys was stressed, as was the need to work with other income-generating programmes such as SEEGAAD (SEMMA) that have developed an entire approach and support system for villagers to establish small family businesses and set economic/financial targets, rather than providing one-off training workshops.

In deciding which activities might improve livelihoods most successfully and reduce pressure on marine resources, several factors must be considered, including:

- The extent to which the activity is damaging to natural resources and thus whether it is sustainable
- Whether the activity is a traditional one, where the community already has the necessary skills and expertise, combined with a willingness to pursue it
- In the case of potential new activities, whether they are suitable for the community concerned and whether there is a market for resulting products
- Levels of private sector investment and entrepreneurship capacity among local communities also affect success.

7.5.4.1 Environmental friendliness of livelihood activities

The environmental impact of seaweed farming needs further study, and the introduction of new mariculture enterprises and species should always be subject to a thorough Environmental Impact Assessment (EIA). In the case of seaweed farming, a brief study in 1997 found no negative impact in Tanga (Rider, 1997). The impact of *K. alvarezii* is probably minimal as it dies off in the warm season, but there are anecdotal reports that *E. spinosum* is spreading naturally. SEMMA is looking at the feasibility of introducing new hardier strains of *K. alvarezii* from the Philippines which will survive through the warm season, and this would increase the risk of this species becoming invasive. Further studies are therefore critical.

¹⁸The need to eliminate vermin had been recognised decades ago, under British administration, when poison was first tested as a control method (Schaman and Mabrook, 1996).

7.5.4.2 Willingness to change occupation

A major challenge in introducing new livelihood activities is often the unwillingness of villagers to change their occupations. Unusually, fishers in Tongoni, (the beach seiners) changed their main occupation and moved into agriculture. Following the demonstrations of more successful methods of farming, some 80 fishers shifted from fishing (or fishing and farming) to farming alone (41 in 1998 and 39 in 1999). 14 ex-beach seiners (all men) in the sub-village of Putini (Tongoni) and 11 (all men) at Ushongo also turned to farming after the banning of beach seining. A quick survey in 2003 indicated that the number had increased with 41 ex-beach seiners in Tongoni village (15 in Putini, 7 Sadani, 19 Migombani and Lumbwa) all farming. This move of ex-fishers to farming has been of major benefit, they were mainly using beach seine nets that were harvesting a lot of fish as well as damaging the bottom substrate. Much of the willingness of people to change their occupations depends on job satisfaction; this is discussed further in Chapter 10.

7.5.4.3 Markets

A major challenge in livelihood development is accessing markets. In many WIO countries there are few links internationally, aside from some marine products and the seaweed trade. Many potential entrepreneurs lack basic marketing skills, knowledge of existing markets, transport facilities, and means of preserving the quality of a product for traveling (chillers etc), as well capital or credit. Often small entrepreneurs look for a market after they have produced their products rather than developing them according to market demand, as was the case in Tanga with the oyster trials. Similarly, deficiencies in other business management skills challenge profitability. There is thus a major need to introduce basic business, entrepreneurial and marketing skills.

7.5.4.4 Entrepreneurship and private sector investment

In the early days of the project, it became apparent that most smallholders, having been brought up in the socialist era, had over the years become accustomed to selling their labour and hence had little in the way of business knowledge or experience. There is thus a need for training and skills development in business, as has been recognised by projects such as SEEGAAD and SEMMA.



CHAPTER 8: CAPACITY DEVELOPMENT

Eneidy Mzava, Mary Mbura, Joyce Bwindiki, George Uronu, Trudi van Ingen, and Sue Wells

8.1 Introduction

The least well documented and known aspect of the TCZCDP is the work it did to build capacity, although this was the fundamental aim of the TCZCDP, dictating the long 12-year time scale of the project and the approaches and methodologies that were used. Short-term training and skills development, rather than support for degrees and diplomas for long-term career development, was the focus in order to ensure a rapid improvement in service delivery. All groups and key stakeholders were targeted, from primary school children to government officials and from women's groups to the judiciary.

It is therefore important to try and assess the extent to which capacity has increased, although such evaluations are among the most difficult for any conservation and development programme. The resources of the TCZCDP were inadequate for detailed monitoring, as is discussed below, and the total number of individuals touched by capacity building activities is unknown. But as this chapter shows, several thousand children and youths benefited from environmental education programmes, several hundred villagers and local government staff received training and skills development, and women were considerably empowered. Activities relating to awareness raising and infrastructure development further contributed to capacity development for coastal management. Programme activities discussed in other chapters also played a key role, such as development of institutional arrangements (Chapter 9) and the reef and fisheries monitoring programmes (Chapters 5 and 6).

Box 8.1. Capacity building or capacity development, as it is often called, is 'the process by which people and organisations create and strengthen their capacity over time'.

Capacity can be described as the ability of people, organisations and societies 'to perform tasks and produce outputs, to define and solve problems, and to make informed choices' (Europe Aid, 2005).

Capacity building thus involves the development of both individuals and organisations, in terms of skills and general competence, as well as the provision of equipment (with the knowledge of how to maintain it), funding, and the general empowerment of all stakeholders involved.

8.2. Environmental education

Although in 1993, the First Ministerial Conference of East African States (Arusha Workshop and Policy Conference on Integrated Coastal Zone Management) recommended the promotion of environmental education (EE) in primary and secondary schools, this subject was still not part of the school curriculum by the beginning of the TCZCDP. The TCZCDP considered children and youth to be particularly important 'stakeholders' as they are the future generation of coastal resource users and managers. By the end of the Programme, support had been provided for a wide range of activities including the preparation of education materials, training of teachers, school inspectors and District Education officers, and the establishment of youth clubs.

8.2.1. Primary school EE programme

Primary schools, rather than secondary, were the focus, as these are generally located in the villages and what is learnt by the pupils tends to have a direct impact on the whole community.

In addition, primary school enrolment rates are considerably higher than those of secondary schools (Box 8.2). There are around 100 primary schools in Tanga Region but the TCZCDP worked only with those lying in the coastal area.

Limited attention was paid to EE in Phase I, but in 1996 a three day coastal ecology course was given to primary school teachers and to District education staff, and some coastal ecology classes were held for children in the TCZCDP pilot villages. Teachers and education staff developed a draft curriculum. This led to recommendations for an EE component to be included in Phase II, in recognition of the value of EE in awareness raising and community empowerment.

A Regional Education Adviser was recruited to help develop an extracurricular programme on EE and coastal ecology for Standard V-VII (the older primary school pupils) in collaboration with school inspectors, Regional and District education staff, fisheries staff, head teachers of primary schools and also personnel from the Mangrove Management Project (MMP). It covered coastal ecology, coral and coral reefs, sea grass beds, mangroves and relationships between the ecosystems. Complementary teacher and pupil manuals were prepared. The first step was to train teachers, school inspectors and District Education officers in coastal ecology and management, and how to introduce this to schools. Over 50 individuals were trained in total¹⁹. EE Task Forces were also set up in each District to facilitate the process.

The EE programme was first introduced in 1998 to four primary schools in the pilot villages of Kigombe (Muheza) and Mwahako and Mwakidila-Mwambani (Tanga Municipality). Additional schools were subsequently added in other villages that were participating either in the TCZCDP or in the MMP and by the end of 2000 a total of 10 schools were involved. In addition to lessons, children also participated in various conservation activities such as mangrove and tree planting, tree nurseries, keeping the environment clean, and awareness raising activities such as poems, songs, drama and role playing and drawing. EE periods were held before break time, so that if field activities were involved, pupils had time to clean up before resuming normal lessons.

Box 8.2. Tanzanian education system (Al-Samarrai and Reilly, 2004)

Primary from 7 years (Standard 1) up to 13/14 years (Standard VII). Primary school attendance increased following the abolition of fees in 2001, as part of Tanzania's aim to meet the Millenium Development Goal of free primary education for all children by 2015. Nationally, enrolment increased from 50% in 2001 to 95% in 2005.

Secondary junior secondary for 15-18 years (Forms I-IV) and senior secondary or High school (Forms V-VI). Following independence, secondary and tertiary education systems were strengthened to provide the manpower for public administration. Despite this, Tanzania has amongst the lowest enrolment rates in the world for secondary education: in 2000, 6% compared with 27% for Sub-Saharan Africa as a whole; and only 2% of the population aged 25 or over had completed the full 6 years of secondary school. An even smaller proportion reach senior secondary.

Tertiary university, colleges etc. Attended by only 1% of the population.

¹⁹ It is possible that more were trained; the Phase II final report states that 33 teachers were trained in 1998; the Phase III final report states that 40 teachers (12 in Muheza, 8 in Pangani and 20 in Tanga) were trained over the period 2001-2003.

These initial EE activities were considered very successful and were extended to additional schools in Phase III, as other CMAs were established. By the end of 2003, 13 schools in Tanga, three in Muheza and two in Pangani were using the EE curriculum (a total of 18 schools in coastal villages) (Table 8.1)²⁰. The TCZCDP estimates that over 8000 primary school pupils have received EE education through the Programme; an impressive number though it might be an over-estimate due to double-counting. It is believed that EE has influenced the attitudes of children to the use of natural resources, and given them skills and knowledge to identify and find solutions to environmental problems. An added benefit is that the community-based activities (singing, plays etc) is likely to have influenced the attitudes of many adults.

Table 8.1. Children exposed to the EE curriculum through the TCZCDP.

SCHOOLS	YEARS	BOYS	GIRLS	TOTAL
MUHEZA				
Kigombe	1998 - 2004	537	589	1126
Doda	2003 - 2004	28	24	52
Mtundani	2003 - 2004	48	26	74
Total for Muheza	613	639	1252	
PANGANI				
Kipumbwi	1998 - 2004	410	492	902
Ushongo	1999 - 2004	132	108	240
Mkwanja	2000 - 2004	191	206	397
Sange	2000 - 2004	248	210	458
Total for Pangani	981	1016	1997	
TANGA				
Mwahako	1998 - 2004	195	214	409
Mwakidila	1998 - 2004	190	198	388
Kwakaheza	2001 - 2004	286	271	557
Mkwakwani	2001 - 2004	538	515	1053
Changa	2001 - 2004	565	469	1034
Kwanjeka	2002 - 2004	255	333	588
Mabokweni	2002 - 2004	125	89	214
Machui	2002 - 2004	163	94	257
Maere	2002 - 2004	102	110	212
Mwarongo	2002 - 2004	78	87	165
Mabambani	2002 - 2004	71	42	113
Total for Tanga	2568	2422	4990	
Total for Region	4162	4077	8239	

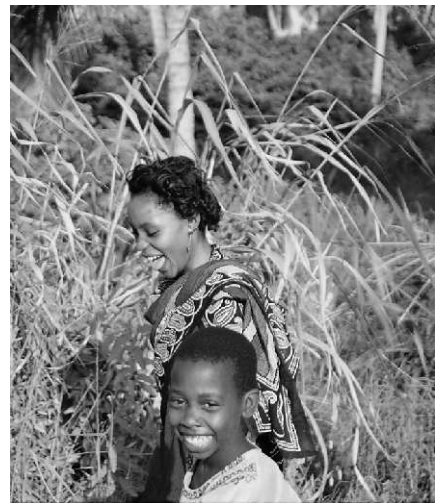
²⁰ This total could be an under-estimate as the Phase III Final report states that EE was introduced to 15 schools in that Phase, which would make a total of 25; it is not certain which figure is correct.

In addition to the lessons and local activities, the TCZCDP supported school children to take part in special events. Participation in the Coastal Environmental Award Scheme (CEAS) was particularly successful. This national competition, launched in 1999 by the international organisation GreenCom, in collaboration with TCMP and funded by USAID, makes awards on World Environment Day (June 5) for environment projects undertaken by community groups of all ages. Projects are registered with the District offices, where a District CEAS Committee is appointed to judge the submissions. Awards are in the form of a certificate and tools or materials to contribute to the project. The three Tanga Districts have participated enthusiastically in CEAS since it started, and several school projects have submitted and won, gaining anything from 10th to 1st prize, and winning items ranging from sports gear to hoes and hose pipes for school gardens.

In 2002 and 2003, one school in each District took part in Kenya's Marine Environment Day. This is organised each year by the Kenya Wildlife Service (KWS), the Wildlife Clubs of Kenya and other organisations in Mombasa to promote marine conservation among children and the general public. In 2002, 36 pupils (12 from each District) and three staff attended, and in 2003, six pupils from each District participated. In both years, Mabawa Primary school, in Tanga City, came away with prizes in 2002, 1st prize in the category 'Environmental Awareness' and in 2003, 3rd prize overall. The event allowed them to learn and share experiences from their peers in Kenya.

As with all components of the TCZCDP, a monitoring programme for the EE component was set up with simple forms for teachers to fill in, to record the number of pupils taking part in EE activities on a daily basis. In addition, the District Education department staff are expected to monitor implementation of EE activities every six months. It seems that these procedures have not been maintained at school or District level, as statistics on the number of pupils involved in EE were difficult to obtain. At the end of Phase III, direct support for EE from the TCZCDP ceased and few schools now teach EE, for several reasons including:

- Some of the teachers trained in EE have been promoted to head teacher, have been transferred to other Districts or have gone on to further studies
- Decline in interest, partly attributed to a lack of refresher courses
- Inadequate teaching materials, with those that exist needing revision and updating.



One school, in Kigombe, is reportedly still teaching EE with the TCZCDP books and materials, because the teacher is highly motivated and made it a high priority. Although there are no longer EE lessons in Tanga City primary schools, environmental activities take place outside the classroom, and these schools continue to perform well in the CEAS competitions. This demonstrates the importance of committed individuals, and indeed much of the early success of the EE programme was due to the enthusiastic Regional Education Officer, as well as positive feedback by the TCZCDP staff on the work undertaken. With the cessation of donor funding and lack of enthusiastic individuals in each District, EE has unfortunately declined.

8.2.2. Youth Clubs

Phase I identified that village youth are often those already involved in, or about to be involved in unwise use of coastal resources. Youth unemployment in Tanzania tends to be considerably higher than unemployment overall and causes a range of social problems (Juma, 2007). This has led to the development of several national youth club programmes, many of which have an environmental component such as the 4H clubs (the Tanzanian arm of the international youth development club founded in the USA) and the Mali Hai Club (a national NGO concerned with conservation education). After Phase I, it was recommended that the TCZCDP should co-operate with such programmes to set up youth environmental clubs in coastal villages, in the hope that at minimum this might help to reduce dynamite fishing. Therefore in 1998 environmental youth clubs were set up in the pilot villages (Mwambani, Kigombe and Kipumbwi), involving in total over 100 members (Table 8.2).

Table 8.2. Youths involved through TCZCDP in environmental youth clubs (Phase I).

VILLAGES	BOYS	GIRLS	TOTAL
Kipunguni Pangani	17	18	35
Kigombe Muheza	17	23	40
Mwambani/Mchukuuni - Tanga Municipality	19	16	35
TOTAL	53	57	110

Youth clubs were also established in Sahare-Ndumi (Mwarongo-Sahare CMA) and in Kipumbwi, and in Phase III, six new clubs were set up. Teachers from local schools ran the clubs and members were trained in coastal ecology and management, planning and gender issues. With the help of the District education staff and teachers, they developed their own guidelines to reduce negative impacts on the environment. Some were also trained in fundraising, with the aim of helping to make the clubs sustainable. The TCZCDP also supported exchange visits between clubs. Youth club members planted trees, cleaned up the environment, helped the VEMCs to plant mangroves, and participated in marine and land patrols and vegetable growing. As representatives of their clubs, the leaders participated in the VEMCs in the planning, implementation, monitoring and evaluation activities related to management of the CMAs. They also helped to raised environmental awareness by presenting songs, drama, and poems in several events.

Although exact figures are not known, the TCZCDP probably assisted in the setting up of over 10 clubs and supported at least a couple of hundred youths in a range of activities. Since the termination of the EE programme, support for youth clubs has also ceased. The Districts have lacked resources to continue and it seems that some of the clubs may have ceased due to lack of support and motivation. Whether the early success of the youth clubs contributed to the decline in dynamite fishing during the Programme, and the recent increase in dynamite fishing is thus linked to current lack of support for the youth clubs, can only be conjectured.

8.3. Training and skills development

In each Phase, one or more Result areas of the logframe was aimed at the delivery of training and skills development. For many of the training events, suitable trainers and facilitators were available within the TCZCDP. Where necessary, outside assistance was brought in such as:

- Business management for the Community Development Fund participants, using a trainer from KWS in Kenya
- Mariculture using scientists from the University of Dar es Salaam
- Militia training using District militia personnel
- Turtle management training in Pangani using the NGO Sea Sense.

People were also sent on courses and institutions elsewhere, such as:

- The game scout training institute in Ruvuma Region for training of village militia (Phase I)
- The coastal leadership course run by URI/CRC and WIOMSA (Phase II)
- Programme officers course in Arusha (Phase II)
- Prosecution course in Arusha (Phase II)
- Horticulture in Arusha (Phase II)
- Forestry in Morogoro (Phase II)
- Monitoring and evaluation in Nairobi with IUCN-EARO (Phase III)
- Mangrove monitoring at UDSM (phase III).

Expatriate technical assistance is often controversial on account of its high cost. However, from the beginning of the Programme, the Regional Administration acknowledged the lack of skills and capacity for coastal management in the three Districts, and IUCN was asked to provide technical assistance. This was progressively diminished: four Technical Advisers (TAs) in Phase I, two in Phase II, one in Phase III and none in Phase IV. The TAs by and large played an important role in providing on-the-job training, and acting as the principal resource persons for many of the training events. The role of the TAs, clearly specified in their TORs, was to 'assist' the TCZCDP stakeholders rather than 'do' their work for them. The IUCN Marine Programme Coordinator in Nairobi also provided additional technical assistance throughout all Phases. Short-term expatriate and local consultants supplied technical inputs or training on a wide range of topics including mariculture, traditional management, forestry, agriculture, gender, institutional development, fisheries, institutional capacity assessment and revenue generation. Additional technical input came from other international programmes such as RFIS/SADC and CORDIO/SEMP.

It was recognised that it would be unrealistic to expect each District to have all the technical skills required for such a complex issue as ICM. The aim was therefore to build collaborative arrangements with appropriate national technical institutions who would provide technical services on a contract-basis as required by the Districts once expatriate technical assistance ceased. By the end of Phase III, this was increasingly occurring. Local consultants were used more often than expatriate ones and technical assistance for reef monitoring work was being provided through the MoU developed with IMS. The IMS librarian also helped with the establishment of a cataloguing system for the Regional Coastal Resource Centre (Section 8.5).

The initial training programme was based on an analysis, at the beginning of Phase I, of the roles and responsibilities of the main players in ICM (Table 8.3) and thus the 'core competencies' that they particularly needed. The focus of training for government staff was on the skills needed to help villagers and manage the Programme. An initial step was training for District staff and extension workers in PRA, to encourage them to take a facilitating, rather than directive, approach in their work, and in participatory appraisals and rapid assessment

Table 8.3. Roles and responsibilities of stakeholders in relation to ICM, as defined in Phase I, and refined in the 2004 workshop.

	Roles and responsibilities	Core Competencies
Regional staff	<ul style="list-style-type: none"> • technical advice • coordinate work plans with districts • monitor work performance • provide technical support and training • organise TCCF meetings • liaise with donors • liaise with magistrates and police 	<ul style="list-style-type: none"> • basic knowledge of coastal ecology • analysing and planning skills • technical knowledge and skills
District Government	<ul style="list-style-type: none"> • develop work plans • monitor work performance and progress • provide on-ground support to field staff • analyse fish catch data • provide technical support and advice • report to DMT (heads of departments) and Environment Committee • liaise with magistrates 	<ul style="list-style-type: none"> • basic knowledge of coastal ecology • analysing and planning skills
District Council	<ul style="list-style-type: none"> • approves by-laws and area management plans • forwards plans to Fisheries or Forests Director 	
District extension staff	<ul style="list-style-type: none"> • facilitate and assist villagers to analyse problems and solutions, and to plan, implement and monitor actions and progress • provide technical advice in their specialty • report progress to District 	<ul style="list-style-type: none"> • communication facilitation, animation skills • basic knowledge of coastal ecology, coastal culture and collaborative management • analysing & planning
Management Committees	<ul style="list-style-type: none"> • VeMC prepares village action plans; proposes village by-laws; organises patrols; supervises implementation reports to Village Government • CCC harmonizes by-laws and village action plans; conducts monthly meetings about progress; organises patrols for overall area; M&E reports • VMT monitors reefs twice a year; collect fish catch data every month 	(Not analysed as not present in Phase I)
Ward Executive Officers	<ul style="list-style-type: none"> • convene Ward Development Cttee meetings • take actions recommended • supervise ward tribunals • forward area management plans to Districts • supervise implementation of area management plans and by-laws 	<ul style="list-style-type: none"> • basic knowledge of coastal ecology
Village Government	<ul style="list-style-type: none"> • prepare and approve bye-laws to be reviewed by District Councillors, approve Village Action Plans • convene meetings about issues • approve budgets • execute by-laws 	
Villagers	<ul style="list-style-type: none"> • analyse problems and solutions • implement actions to solve priority issues • participate in patrols, monitoring, and provide evidence for enforcement prosecutions 	<ul style="list-style-type: none"> • planning skills • technical knowledge and skills

so that they could take part in the initial assessments of the reefs and forests. The extension workers then trained villagers. District extension workers are the main avenue for delivering services to the villages. They are often not from the coast and prior to the TCZCDP bad relationships had developed in some instances. Training was therefore given in animation techniques which helped to promote a participatory approach. In Phase I, 18 extension workers were involved, living and working in the pilot villages. Villagers were trained in activities such as preparing and implementing management plans, enforcement and monitoring, and later in skills that would help them improve their livelihoods. Wherever possible, those who were trained then took on the training of others. In total, over 120 training events were supported by the TCZCDP (Table 8.5).

Some 60 Regional and District staff were trained in aspects of programme management including problem analysis, facilitation, action planning, monitoring and evaluation, community based project management and coastal ecology and ICM (Table 8.5). In addition, Regional staff were trained in subjects that they specifically needed (e.g. supervision and monitoring, management of community projects, computer skills) and District staff in skills specific to their roles such as communication and facilitation skills so that they could help villagers with action planning; mariculture, and environmental education to improve the technical skills needed for individual jobs. Between courses, extension workers used their new skills to train nearly 100 villagers from the pilot villages in many of the same topics.

Phase II emphasised upgrading the skills of District and Regional staff, aiming to establish work standards for each position, although this proved difficult. A wide range of training activities were carried out as new components were added, new CMAs developed and the TCZCDP expanded to other villages, necessitating training of further villagers in micro-planning, boat handling and reef monitoring. Gender training (see below), and training in forestry and agricultural skills (Chapter 7) among other topics were introduced. In the second part of Phase II, the concept of strengthening institutional capacity was introduced (see Chapter 9), along with bee keeping, tree nursery techniques and tree seed handling. For villagers, the key skills required for CMA establishment and implementation continued to be taught, particularly micro-planning.

Training continued in Phase III, with two Result Areas dedicated specifically to capacity building and awareness raising, and with training tailored to specific needs. In 2002, an estimated 625 individuals from 15 different institutions were trained. Phase III activities included refresher courses and courses repeated for new villagers and District staff joining the Programme (micro-planning), more advanced courses on topics that had been introduced earlier (boat maintenance, reef and mangrove monitoring, monitoring and evaluation, fisherie data collection) as well as some new specialist topics (e.g. remote sensing, and turtle conservation). Two District staff attended a Coastal Management Leadership course run by WIOMSA and Coastal Resources Center/University of Rhode Island (CRC/URI).

Towards the end of Phase III, institutional capacity and training needs for individuals were assessed. The former focused on reef monitoring, enforcement and the CMA management as these are core activities that will have to be maintained by the natural resource departments in each District after donor support ceases (Kamukala 2004). The latter looked at training needs at individual level and assessed 325 people, concluding that 18 courses were necessary. Some of these were provided by the TCZCDP in Phase IV (e.g. report writing and

presentation skills, microplanning, refresher training for village and District officers in reef monitoring and fish data collection), others by other institutions (e.g. computer skills for District Staff), and some have not yet been given.

Evaluating the impact of the training is not easy as, with a few exceptions (e.g. gender training, see below), there was little formal monitoring. However, the opinions expressed by TCZCDP stakeholder during Programme evaluations and in the Lessons Learnt 2004 workshop provide some indications. These opinions can be assessed in relation to the four areas in which a coastal manager needs competency as identified by Kiambo *et al.*, (2001, Box 8.3).

Box 8.3. Skills need by coastal managers. Source: Kiambo *et al.*, (2001)

Successful coastal management programmes need individuals who can articulate a vision and inspire collaboration. Coastal managers must have good personal and technical skills and be able to draw knowledge and ideas from a range of sectors: legal, economic, scientific and sociological. They must also be good strategists and leaders. Skills are needed in four key areas:

- **Professional:** Process-focused skills that are essential for dealing with customers and clients, user groups and stakeholders, such as: facilitation, communication, strategic planning and dispute resolution
- **Project management:** Skills such as managing and conducting meetings, fundraising, organisation and leadership, budgeting, supervising, and work planning
- **ICM principles:** Process skills, such as understanding the project cycle, and implementation skills such as: special area management planning and zoning, community participation, public education, use of science for management, demonstration activities, two-track approach to management, issue profiling, policy and legislation
- **Technical:** General understanding of technical issues such as water quality, ecosystems, GIS, economics, mariculture, erosion, marine pollution.

Professional skills

- Communication, facilitation and animation skills: District extension staff found these the most effective and useful courses, and are still using these skills
- Planning and analysis: District staff and villagers found these courses highly practical and are still using the skills learned
- Gender training: caused significant changes in villages see below
- RA: considered a useful technique as it helps to identify problems and their causes
- Business management training for villagers involved in the CDF (see Chapter 7) in Phase I: Some villagers felt this was useful, and that it provided skills still being used by some, as well as empowerment at village level; others felt that it was not of value since the CDF ceased
- Game scout training for controlling vermin: not useful as it focused on guns, which villagers do not own.

Project management skills

- Supervision and monitoring, community based project management, operation and maintenance of community projects, participatory monitoring and evaluation: considered very useful by District staff
- Programme planning, budget monitoring and control, fundraising, report writing and presentation, data processing and analysis, time management: not evaluated.

Understanding of ICM principles and practice

- Micro-planning learning how to formulate action plans with clear, achievable objectives and identify the actions to achieve them: was greatly valued by villagers, many of whom are still using the skills they were taught
- Enforcement: those who took part in training on enforcement (militia training, boathandling, patrolling, prosecution) generally considered it to be effective. The militia training in Phase I reportedly helped villagers curb destructive fishing in their own villages, but guns training was unnecessary since these were not used by villagers. However, although a range of stakeholders were involved (Navy, police, magistrates, community) this training has clearly not had a very long-term impact given the resumption of dynamite fishing (see Chapter 5)
- ICM, Community-based/collaborative management, pilot village approach: not evaluated.

Technical skills

- Coastal ecology: considered of high value due to the awareness it raised. Villagers found that it helped them express their concerns about coastal issues and gave them a better understanding of the impact of their activities on natural resources. It had a major impact on the judiciary (public prosecutors, magistrates, District commissioners, inspectors, Marine Police and other government staff involved in law enforcement); magistrates who attended a course gave greater penalties (e.g. higher fines) and acted faster than those who did not. It was also given to all District staff involved in the Programme, and to primary school teachers, which resulted in initiation of the EE programme
- Coastal culture: not found useful, as the District extension workers already had this information
- Use of fuel efficient stoves: not linked to other TCZCDP activities and ultimately very few stoves were used.

TCZCDP training improved leadership and the effectiveness of committees, as demonstrated by people being able to do their jobs more effectively, and better governance and teamworking, all vital for successful ICM.

Study tours were considered very useful by those who participated. In Phase I, villagers and District personnel went to Zanzibar to look at seaweed farming and mangrove replanting; other trips were made to Mtwara to see how dynamite fishing was being addressed through the Rural Integrated Project Support (RIPS) Programme (funded by FINNIDA), and to Kisite in Kenya to look at the Marine Park. In Phase II, villagers went to Arusha to learn horticulture. In Phase III, villagers went to Duruhaitemba in Manyara to study forest management; a group went to Shimoni in Kenya (Box 8.4), and Tanga Municipal Councillors went to Mafia to study the Marine Park. The visits to Malindi and Mombasa were important in demonstrating the value of reef closures (Kenya Marine Parks) and mangrove planting.

8.4. Public awareness and communications

The TCZCDP did not have a large budget for publicity and communications, but this was an important aspect of the Programme at three levels:

1. local level, in order to promote greater understanding of the need for coastal management and thus uptake of the Programme interventions;
2. national level, in order to inform the national agencies of the results of the innovative initiatives being undertaken, to obtain feedback and approval, and to inform other Regions and Districts of the progress being made;
3. and the international level, in order to share experiences with other coastal management programmes worldwide.

At the local and national level, most emphasis went on working with journalists and others involved with the media. At least in Phases I and II, journalists were regularly invited to activities such as major workshops and training events and the Programme received much publicity in the print media. A TV interview was carried out and there were some radio appearances, organised with journalists from Dar es Salaam. In Phase III a general brochure about the Programme was produced and disseminated widely, both nationally and internationally. A poster explaining the fisheries regulations was produced in English and Swahili, and was distributed to all the villages, schools, and government and ward offices in the Region. In 2005, an Awareness Strategy was produced (Matiru and Mwangi, 2005) that provides ideas for the Districts and Region on future communications and awareness activities, building on previous experiences of the Programme, and with a particular emphasis on a fisheries permit system (see Chapter 9). Suggestions include a schools campaign, productions of further booklets and posters, and more study tours.

Programme staff attended numerous national and international meetings and conferences (e.g. WIOMSA annual symposia, ITMEMS) and presented the Programme's activities. The TCZCDP was a case study in a seminar of the Conference of the Parties of the Convention on Biological Diversity in on incorporation of CBD elements in ICZM projects. Several publications and scientific papers were produced over the course of the Programme (see Bibliography, Chapter 11). Although it is difficult to assess the impact of such activities, the TCZCDP became in a sense a 'show-case' or model project as demonstrated by the large numbers of visitors who came to learn about the management approaches being developed and the methods used. Visitors came from both from elsewhere in Tanzania (particularly other coastal management projects such as Pemba, Mtwara, Kilwa, Zanzibar) and overseas Kenya, Eritrea, Mozambique. This not only benefited the visitors, but allowed the TCZCDP to learn from experiences elsewhere.

Box 8.4. Study tour to Kenya 2001

A group of 19 people, comprising members of the CCCs for the Mwarongo-Sahare and DeepSea-Boma CMAs, Ward councillors from three adjacent Wards, and District officers, visited the Shimoni area of southern Kenya to share experiences in coastal resource use and management. They visited a number of groups:

- The Wasini Women's group which manages a mangrove boardwalk for tourists, constructed by KWS with IUCN-EARO assistance. The Group use the entrance fees for maintenance of the boardwalk as well as community development projects. This demonstrated a form of enterprise that has not yet been tried in Tanga
- The Mkwiru Women's group seaweed farming operation which had started this activity after visiting Tanga themselves; the Tanga visitors were able to provide advice on some technical problems that the group had experienced
- A private boat owners association which was established to support individuals earning income from taking visitors to the Marine Park; various problems were discussed and shared
- The Kisite Marine Park and Mpunguti Marine Reserve, which are managed by KWS; the Marine Park is a no-take area, so experiences were shared about this management tool, including problems of illegal fishing, as well as conflicts with and benefits from tourism. The Marine Park was judged a benefit to both fishers and communities

The information gathered was considered very useful and the villager to villager contact was considered particularly beneficial.

8.5. Infrastructure and equipment

The TCZCDP did not provide support for infrastructure development, as Programme personnel were housed in buildings belonging to the Regional Administration, and the District staff attached to the Programme operated from their own facilities. However the establishment of the Regional Coastal Resource Centre (RCRC) required the renovation of the old building in which the TCZCDP was housed in the centre of Tanga, to have several purposes, including provision of:

- An educational facility for schools, youth clubs, and other groups
- A facility where meetings, workshops, and other events, such as displays and exhibitions relating to marine and coastal resource management can be held
- A coastal and marine resource management library providing a source of technical information
- Housing for the regional databases for coastal and marine management, that ultimately should include a regional coastal/marine GIS system (to be linked to the more general TCMP GIS system, and act as a field sub-station for IMS).

The RS and the three Districts jointly manage the RCRC, and day-to-day management is overseen by the Regional Secretariat (RS) through the RFA. Financial accounting is the responsibility of the RS, as is the upkeep of the building and provision of a secretary/receptionist who welcomes visitors, manages the library and provides support for meetings. The Districts are responsible for operational costs such as a part time office attendant, electricity, e-mail facilities, water and maintenance of equipment and the library. There is presentation equipment, including TV, video, data-projector, computer, slide

projector, and overhead projector for use in meetings, and public awareness and environmental education events. Ultimately, it was thought that income could come from its use as an internet café, sale of sodas, and fees for hiring the meeting room (see Chapter 9).

The RCRC has been a great success in terms of its use for meetings and as a focal point for coastal management activities. However it is not yet managed as originally planned, especially the library, and still lacks a full time staff member to manage it. Ultimately it is hoped that each District will make a greater contribution to its maintenance and upgrading.

For other Programme activities, a range of equipment was provided by the TCZCDP: computers and other office equipment, generators and solar panels for power, transport (motorbikes and vehicles), boats and enforcement materials (radios, torches), cameras, communications equipment, monitoring equipment (dive gear, reef and mangrove monitoring equipment). Efforts were made to ensure that this was regularly maintained, although this was often a challenge. The equipment was handed over by the donor to the Districts in June 2007, so that activities could be maintained.

8.6. Empowering women

From the beginning, the TCZCDP recognised the needs of men and women and took explicit steps to involve both in all steps of resource management, to ensure greater equity in well-being, access to resources, participation in decision making, and control over resources. The Gender and Development (GAD) approach was used, which recognises that unequal relations in power between men and women and between different socio-economic groups often reviews the way in which gender activities contributed to improving equity, and at how women have benefitted from TCZCDP activities, providing a summary and update of the more detailed analysis provided in Ingen *et al.*, (2002).

As elsewhere in Tanzania, there are increasing pressures for women to contribute to household income. Fertility at the beginning of the TCZCDP, though falling, was still high, with a national average of five children born to each woman, and in some coastal villages even more. Only a small proportion of girls complete school and an estimated 31% of women in Tanzania are illiterate, which contributes to the high population growth since educated women generally have fewer children (Golder and MacDonald, 2002). A wealth ranking exercise conducted in three coastal villages in Tanga Region in 1996 estimated that 68% of women were in the poorest categories, whereas only 24% of men were in these categories. This is presumably because women own and control very few resources, and have limited earning potential (Gorman, 1996).

Husbands are generally responsible for meeting the cash requirements of the family although women contribute to school fees and medical expenses. The main economic activities for women are subsistence farming (Chapter 7) and petty trade. Almost all the fishing is carried out by men, with the exception of shallow water prawn (*uduvi*) fishing (Box 8.5), and collection of octopus and molluscs at low tide.

Many women are involved in trading, including the buying and processing (usually frying) and selling of fish; preparing and selling of food, and selling of clothes and household items from Zanzibar. Many women come to the coastal villages from inland towns to buy and fry fish for sale back home. In 1999, there were 600 licensed fish traders in Tanga Municipality, of

which two thirds were women. Seaweed farming has been increasingly taken up by women, who now dominate production (Chapter 7). Other activities in which women are involved include livestock production (especially poultry), mat weaving and preparing roofing material from coconut leaves (*makuti*) (Gorman, 1995).

In the recent past, Islamic and local traditions and customs had a strong influence on the behaviour, activities and participation of women. The traditional, male-dominated social system (*ubabe*) prevents married women from going out of their houses, for example to attend meetings. They are also not allowed to speak in front of, or sit close to men, and must cover their heads with *khangas*. Additional reasons that prevented women participating fully in the development of the village included the fact that they did not necessarily know their potential roles, their lack of confidence and also a general unwillingness to change the system.



8.6.1. Methods to improve gender equity

The TCZCDP took a number of pro-active steps in Phase I and undertook an analysis in Kigombe village to determine why women did not participate more actively. As a result of this, specific individuals were made responsible for gender, gender committees were set up in the villages, and a Regional Gender Adviser was appointed. District gender 'linkages' were responsible for coordinating, following up and monitoring gender issues; and gender task forces, comprising three to four technical staff, were made responsible for planning and monitoring gender mainstreaming. An inter-District gender task force was also established comprising the Regional Gender Adviser, the Regional Community Development Officer, the three District Gender Linkages and an IUCN TA. 'Role models' were created by ensuring that there were women in all the socio-economic and resource assessment teams that were established by the Programme, as well as in the extension worker teams (Ingen, 1998; Ingen and Kawau, 1998). A further analysis of the three pilot villages was undertaken in Phase II, at which stage the monitoring matrix was developed.

Box 8.5. Female prawn fishers at Ushongo village

The majority of women in Ushongo village are involved in small prawn (*uduvi*) fishing. The *uduvi* appear irregularly (at 3-6 month intervals), usually after heavy rain or when there is a big outflow from the rivers into the sea, and stay for 3-6 days. The women say that the prawns follow the currents to come close to shore when there is heavy rain. Prawn fishing involves two women holding a *tende* or net and one herding the prawns into it. Some women use mosquito gauze as nets. They dry the prawns in baskets in the sun. They can collect up to 1.5 gunny bags of prawns in a day and, if well dried, there is no problem selling to the traders who visit their homes. Most of the prawns are sold at local markets, especially in Tanga City, for local consumption as a 'relish'. In the early 1990s, the women said that prawns were getting scarce and that intervals between their appearance could be as much as six months. They considered that dynamiting was an important cause of the decline, since 'prawn live in the reef like other fish, and when their homes are demolished they flee' (Gorman, 1995).

Specific methods were used to involve women as follows:

1. **Participatory Approach:** this gives a more balanced picture of needs, opinions and interests of the different groups of the community, and ensures a majority supports the conclusions and decisions. Focus group discussions involving a few people in the group (1012) was particularly useful for engaging women.
2. **Animation:** this involves dividing participants into sub-groups according to particular characteristics (e.g. age, interests, gender etc). The meeting topics were discussed between subgroup members, the smaller numbers and shared interests encouraging people to express themselves. The subgroups then reported back to plenary which stimulated dialogue and a group discussion between all interest-groups in a village, and encouraged women to defend their own points of view, even if they differed from others.
3. **Special activities:** if women were absent or participating in very low numbers meetings were held separately, first with women and then with men, to identify reasons for the lack of female participation. Sometimes this was because meetings were held at times that were unsuitable for women; sometimes women had no self confidence and felt shy. Solutions to such obstacles included issuing separate invitations to women, and using female committee members or influential women to mobilise female participation in meetings.
4. **Training activities:** to raise awareness of the importance of womens' participation in decision making, planning, implementing and evaluating development projects.
5. **Establishment of village gender committees:** to monitor and address all gender issues in the village. These committees were well balanced with five women and five men.
6. **Encouraging equitable participation in Programme activities at all levels:** for example in analysing and planning meetings, training courses, study tours, workshops and committees.
7. **Gender profiling and monitoring** (see 8.6.2).

8.6.2. Monitoring

In Phase I, there was no defined gender strategy, and activities were carried out on an ad hoc basis. Women took part in assessment and extension teams, techniques to stimulate the participation of women were introduced, gender disaggregated data were collected, equal representation in TCZCDP activities was encouraged, and gender equity was assessed.

In Phase II, improved equity between men and women was made a special focus and a gender monitoring matrix was prepared, with four sub-results:

1. Equitable participation of women in analysis, decision making and negotiation;
2. Equitable participation of women in meetings and committees;
3. Equitable participation by women in coastal resource use and management;
4. Equitable participation of women in Programme benefits (e.g. material, technical and educational assistance).

The monitoring programme, developed by the Inter-District Gender Task Force, contains quantitative indicators and means of verification for the four sub-results. "Warning flags" or standards are given, to enable situations to be identified where special action should be taken. Some of the warning flags are quantitative, such as number of women present in meetings, on committees and taking part in various activities. Others are qualitative, such as failure of

women to participate in voting or decision making, and men disputing the rights of women to do this. The monitoring matrix was aimed at providing a tool that would make it easy to know what should be done, by who and when and what action will be taken to address certain problems. Targets were set (e.g. 50% representation of women in VeMCs). The monitoring was undertaken by the gender committees in each village.

8.6.3. Participation of women in decision making, planning, meetings and committees

At the beginning of the TCZCDP, just a few divorced and older women attended meetings as listeners, and women made up less than 5% of participants. Men did not value women's contributions and women generally did not have the courage or confidence to face leaders and question this. In addition, meetings were often held when women were busy preparing evening meals. As a result, women did not participate in analysing the priority issues facing their villages.

The gender component of the TCZCDP has led to a more balanced representation of women and men in committees and decision making bodies, and some women now have key positions. VEMCs are now generally well gender balanced, with about 40-50% representation by women and CCCs usually have 25% women, meeting the target set in the monitoring matrix (Table 8.4). As a result, VeMCs started to address issues of particular interest to women, such as control of crop vermin (wild pigs and monkeys), and beach pollution.

Training and study tours showed women that they will not know what is going on and will not be able to benefit from Programme activities if they do not participate in meetings. Women now have confidence and speak in front of men at meetings without fear of reprisal, greatly encouraged by the female extension workers. More women are taking a leadership role (Table 8.4) and are increasingly involved in decision making, with some now aspiring for District Council elections, and others seeking to be elected as chairpersons and village Government members. By 2004 the policy was that if the chairperson is a woman, the secretary should be a man, and vice versa. However, although women are ready to take up leadership positions they still lack a full understanding of the roles and responsibilities of such positions. In addition, gender balance on the TCCF and in District natural resource staff positions is still poor.

8.6.4. Participation of women in coastal resource use and management

There is insufficient data to show trends in the participation of women in most activities, and the situation in each village varies greatly. However, data on seaweed farming demonstrates the importance of this activity to women. Women have taken part in seaweed farming since it started in Tanga, and this has given a big boost to household incomes (Chapter 7). For example, women seaweed farmers in Mkwaja have said they are happy because now they own something and if they get divorced they will not leave empty handed. Others say divorce rates are now lower because women are generating income in their homes and can buy school materials for their children. Women have also been active in replanting mangroves in degraded areas as well as planting village woodlots, especially in Kigombe village.

Table 8.4. Involvement of women in Programme activities since Phase III

(Source: IUCN 2005b).

Involvement of Women	Districts					
	Muheza District		Pangani District		Tanga Municipality	
	Jan 2001	Mar 2004	Jan 2001	Mar 2004	Jan 2001	Mar 2004
People trained in gender in Phase III	71 villagers (25 women/46 men)		270 from Village Governments & VEMCs		55 from Village Governments, CCCs, VEMCs	
% women participating in all training (target 50%)	50	40	40	40	50	40
% representation of women in CCCs (target 25%)	25	25	25	25	25	25
% of representation of in VEMCs (target 50%)	50	50	40	40	40	40
% women participating in environmental activities (target 40%)	30	35	40	35	35	40
No. women in key positions in CCCs and VeMCs	1 chair, 1 secretary	2 chairs, 1 secretary	1 chair, 1 secretary	1 chair, 1 secretary	1 chair	1 chair, 1 secretary
Women:men actively participating and in elective posts	14 : 83		28 : 128		35 : 120	

8.6.5. Benefits to women of TCZCDP activities

Women were included in most of the training courses (Table 8.5), including micro-planning, business management skills, mariculture techniques, preparing fuel-efficient stoves, beekeeping, record keeping and accounting, tree-nursery techniques, animation, hunting techniques, horticulture, agro-forestry and organic farming. Some have been trained as trainers in micro-planning, business management skills and mariculture, and as village animators. Women participated in all study tours and workshops organised by the Programme. Key women, e.g. those facilitating resource management in the villages, those in decision-making and leadership positions at community and higher (government) levels, and those on the coordinating bodies for natural resource management, were targeted for training.

Women also received a range of technical and material assistance for example for agro-forestry and organic vegetable growing, controlling vermin, reducing beach pollution, preparing fuel efficient stoves and developing woodlots (Chapter 7). An additional benefit of these activities was that their confidence increased, which led to their successful participation in management activities and decision making bodies, and they are now more prepared to express their views publicly. Some women have even actively participated in typical male activities such as enforcement patrols.

8.7. Conclusions and lessons learnt

The TCZDP has undoubtedly led to much greater awareness of the need for coastal management, at all levels: individual (children and adults), village, District, Region and nationally. Although it was intended that all training and capacity building efforts should be monitored, this proved difficult in many instances. The number of training events in itself is not a measure of capacity building, and indeed training can have a limited impact if organisational arrangements and systems (e.g. District planning and implementation procedures) are not also modified (see Chapters 9 and 10). In an external analysis for a thesis, Torell (2003) concluded that the training programme was focused too much on individuals rather than broader groups so that when, for example, Regional staff returned to their Districts there were major capacity gaps. However, individuals in both villages and local government report that they regularly use the skills and techniques gained from the training provided by the TCZCDP, not only in coastal management activities but also in other aspects of their lives.

8.7.1. Government capacity

Both Regions and Districts are responsible for capacity building. The 1998 Policy Paper on Local Government Reform states that District Councils are fully responsible for not only recruitment and payment but also development of personnel. Kamukala (2004) found that the District and Region officer positions match well with the jobs required for the TCZCDP activities to continue, and indeed mainstreaming in this sense is proving straightforward. However, in all three Districts, many of the staff will retire in 2007, some having been with the District for over 20 years. The lack of new recruitment by District government during the course of the TCZCDP, and thus of new people being trained, is a major cause for concern, as it is not clear how core activities will be sustained (Kamukala, 2004). The leadership succession is a particular concern, as well as the fact that the Programme trained many people who are now not in the Natural Resource Department which is responsible for ICZM. Thought will need to be given to these issues, to ensure that well qualified staff are appointed to improve service delivery to the communities. There is also a need for more well-trained extension workers, as these have played a key role in the success to date of the TCZCDP.

Key constraints that hinder capacity development include limited school education, lack of analytical, planning, management and technical skills, and lack of incentives, and these are discussed below. Further specific training needs that have been identified through the capacity needs assessment (Kamukala 2004) and during the compilation of this publication include:

1. Training in enforcement, particularly for personnel involved in patrols (e.g. training in the recording of evidence of illegal activities);
2. Training in report writing, presentations and financial management for District staff;
3. Training in maintenance of equipment;
4. Training in conflict resolution;
5. Refresher courses in all subjects for existing staff and ensuring that new staff receive adequate training in all relevant subjects; Heads of Department in particular need a good understanding of ICZM, as well as Councillors.

8.7.2 Limited school education

Despite high levels of commitment and much practical experience, the lack of formal education is a serious obstacle (Kamukala, 2004); as Lewis and Juma (2005) note, it is difficult to sustain progress on enthusiasm and goodwill alone. Only about 9% of pupils go on to secondary school, accounting for the low number of secondary compared with primary schools. Kamukala (2004) found that, of 51 District staff assessed, just over half had reached Standard VII/VIII (Middle School), just under half had reached Form IV (junior secondary), and only three had reached Form VI (High School).

This has a fundamental impact on ICZM at many levels: for example, enforcement officers may not have the writing skills for the paperwork needed to provide the supporting evidence for prosecutions; and DNROs may be unable to do the budgeting and other financial management that is required for adequate reporting and documentation of Programme activities. The effect of poor education was aggravated by decentralisation, which meant that a number of people were placed in jobs beyond their capabilities. Furthermore, some of the training courses, particularly those on planning and monitoring and evaluation may have been too complex and not fully understood. If an assessment of institutional capacity had been carried out at the beginning of Phase II, as soon as decentralisation was underway, the low educational levels would have been revealed earlier, and more appropriate technical assistance and training could have been provided.

8.7.3. Lack of analytical, planning, management and technical skills

Despite training, many District staff in positions relating to ICZM have low capacity in these key competencies. Tanzanian culture is largely oral, and experience and knowledge is generally transferred verbally rather than in the written form. Torell (2003) points out that this can result in learning taking place between peers, rather than up or down within an institution or between generations, and also that, since it is not captured in writing, facts may change with the telling. The TCZCDP was based very much on the western approach of documenting experiences in writing, with a requirement to produce regular written reports, which was a challenge to many stakeholders.

Kamukala (2004) found that capacity for analysis and management of data urgently needs building up in each District. An officer with data analysis and management skills is ideally needed within each District, as well as a good system for sharing skills, expertise and the data itself between Districts and Region. The ability to conduct evaluations and reviews is also still underdeveloped as evidenced by the difficulties encountered when compiling this publication (Wells, *personal observation*).

Weak financial capacity is still evident, as well as limited skills and experience in key areas such as fund raising and the management of consultants. Further training is needed in all Districts to develop these skills.

8.7.4. Lack of incentives

As pointed out by Kiambo *et al.*, (2001), while commitment and capacity are needed in all sectors from political decision makers to fishers, the coastal managers are the engines of progress. In the case of the TCZCDP, these are the District staff who are responsible for developing and implementing work plans, and the extension workers who provide services to the communities. Equally important are the Regional staff, who have an advisory role, and

should coordinate and provide technical support to District staff, build capacity, monitor performance and offer facilitation services. However, there are few incentives for either District or Regional personnel and promotion is often based on the length of time spent in a job, rather than competence or skills. In addition, staff are often inappropriately assigned to their posts with inadequate skills and training for example, in 2004, a bee keeping officer was doing reef monitoring; and a Fisheries Officer responsible for refrigeration is processing fisheries data. It is essential that appropriate incentives are found to maintain committed and energetic staff.

8.7.5. Village capacity

The initial soci-economic survey in 1995 (Gorman, 1995) found that villagers already had a good understanding of fundamental marine and coastal issues, such as the importance of the reefs for providing fish, and the role of reefs in reducing the power of waves. There is anecdotal evidence that this is even stronger now, and the various end-of-Phase evaluations invariably found that villagers felt that the TCZCDP had helped to develop their capacity. However, there is a need to find suitable incentives and rewards for communities that show strong commitment and motivation. This might include further exchange visits and study tours which were felt to be particularly effective at raising awareness and gaining experience. On-going training of reef monitors, patrols and other individuals directly involved in coastal management activities is also required.

8.7.6. Awareness raising and environmental education

The TCZCDP EE curriculum was well developed and successful locally but did not become part of the national curriculum, and thus there was no requirement for it to be supported by central government. However, the 2002 National Integrated Coastal Environment Management Strategy calls for a formal curriculum in coastal management from primary schools to university level and the development of coastal education materials. The experience of the TCZCDP could be used to help make this a reality. Further support is needed specifically in Tanga Region to maintain and build on the EE work that was initiated. It is recommended that:

- a review be undertaken
- other teachers be trained in coastal ecology and EE, and further seminars and workshops encouraged
- awareness to start at pre-primary level to achieve a stronger positive attitude in conservation
- Secondary schools be involved in activities that highlight coastal management issues
- EE be maintained in primary schools.

Although in Phase I it was proposed that the EE programme and awareness raising activities should be undertaken in collaboration with related initiatives elsewhere in the countries this did not occur enough and may have contributed to the lack of long term sustainability of this initially highly successful Programme component. The quality, content and layout of the teaching aids and other resource materials that were produced could be improved, but the relevant District officers would need assistance for this. Excellent examples that are more user-friendly and attractive, with clear and colourful illustrations, exist from other national and Kenyan initiatives (Francis *et al.*, 2000; Greencom, 2000; Doody *et al.*, 2003). Materials that document the experiences of the Programme, aimed at schools and the general public (booklets, leaflets, video documentaries) should also be produced, as recommended in the

2005 TCZCDP Awareness Raising Strategy (Matiru and Mwangi, 2005). If resources are found, the Programme should promote and develop the establishment of more youth clubs, and encourage participation (e.g. villagers, schools pupils, District Council members) the *Nane-Nane* Show and other national initiatives to promote the main goals of the Programme. The Programme should also continue to organise activities for World Environment Day with sponsorship from the Districts and the private sector, such as sisal estates, fish processors, seaweed buyers and hoteliers. Cooperation with other conservation programme/institutions nationally and internationally (Kenya Marine Day, CEAS, and KICAMP) is also recommended (Kamukala, 2004).

8.7.7 Empowerment of women

The TCZCDP has shown it is possible to improve women's participation without violating customs and traditions. Awareness and support for participation of women in coastal management, both at government and at village level, has increased in all three Districts and there is a general feeling that gender is now well mainstreamed and monitored. Women's participation has improved in several ways, notably in CMA management as demonstrated by their participation in meetings and on committees. More women are interested in holding key positions on committees and can argue and defend their points of view in front of men. It is less clear whether the TCZCDP led to greater economic benefits for women, or whether efforts to increase their participation in use and direct management of marine and coastal resources have been successful. This is partly because information to demonstrate such changes is not available. Many women, nevertheless, no longer rely on their husband's income and are raising funds to pay school fees.

The following were particularly important in building gender equity:

- 1) The use of techniques that stimulate the participation of women, such as participatory and animation techniques, and exchange visits;
- 2) The provision of adequate training and awareness raising on gender, involving all stakeholders and including men, and providing periodic 'refresher' training; establishment of 'gender' as a separate component of the TCZCDP ensured that this topic was given adequate attention;
- 3) The creation of "role-models" for women, by appointing women village facilitators and encouraging women to take key positions on committee, as well as encouraging leadership and responsibility in promoting gender equity;
- 4) Ensuring equitable participation by women and men in all activities;
- 5) Undertaking gender profiles in one village in each District and establishing a gender monitoring programme, that is well understood, simple to use, and that is maintained;
- 6) Suitable timing of meetings to ensure that all concerned, especially women, participate actively;
- 7) Appointing a Regional Gender Adviser, District Linkages, and a Gender Task Force and making them responsible for planning and monitoring gender mainstreaming.

It is hoped that gender issues have now been fully mainstreamed in District coastal management activities in Tanga Region, and that this gender sensitive approach will be maintained without external assistance.

Table 8.5. Training undertaken throughout the TCZCDP. Sources: Annual reports for 2001 and 2002; end of Phase III report, semi-annual Jan-June report, 2003. *Note: Numbers of participants and length of courses are approximate, since information was not consistent in project reports. EW = extension worker.*

Course	Date	Participants	Trainers	Location
Planning and management				
Micro planning	Oct 1995	9EW, 3 Villagers	TCZCDP	Tanga
	Nov 1995	About 100 villagers – all villages	EWs, villagers	villages
	Jan 1999	20 villagers (Moa)	EWs	
	May 2000	96 committee members	EWs	
	2000	VEMCs Sange - Mkwaja CMA (Pangani)	District staff, EWs	
	2002	83 villagers in 6 villages in Boma-Mahandakini CMA; refresher course for 100 VEMC members in 10 villages, Pangani	District staff	villages
Training of Trainers	Jan-Feb, 1996	6 Villagers, 6EW	Kalabaka	Tanga
	Oct 1995	9EW, 3 Villagers	Kalabaka	Tanga
	July 1996	12 Villagers, 11 EW	TCZCDP	Tanga
Facilitation skills (for regional workshop)	June 1995(3days)	5 Programme coordinators and 5 EWs.	Regional Planning officer	Tanga
Pilot village approach & Comm. Based/Collaborative management.	March – April 1996	14 Regional staff; District staff from Tanga (13), Muheza (16), Pangani (19).	DCs; EWs	Tanga
Programme Planning , Monitoring and Supervision.	March – May 1996	12 Regional staff; District staff (Tanga –10, Muheza –12, Pangani –12).	TCZCDP, Reg Advisers	Tanga
Community based Project management; Operation, management and M&E of community projects;	Nov 1996	District staff of 3 Districts + District and Regional coordinators	TRAUDS Training institute from Nairobi	Tanga
Animation, facilitation, PRA, planning, analysing skills and monitoring	Nov 1997	12 Phase I extension workers (refresher course)	TCZCDP	
Coastal Ecology, Planning and analysing skills, Animation, Time management, community based/collaborative resources mgt, PRA	Nov 1997	New programme & District staff (15) (Advisors & DTT)	TCZCDP	
	Feb/Mar 1998	22 District linkage officers	TCZCDP, Kallabaka	
	March 98	19 New EWs	TCZCDP	
Communication, Facilitation, Coastal Ecology, TOT	August 1998	12 Village animators (6M, 6F)	TCZCDP, District staff	
Budget monitoring and control	1998	2 Regional and 3 District Accountants	IUCN-EARO accountant	
Planning and Analysing	May-June 1998	19 new EWs	TCZCDP, Mfuko, Susan, Hatibu	
Programme Management	July 1996-June 1997	Programme Coordinator	TCDC	Arusha
	July 1998 - July 1999	District coordinators (3) & Training advisor (1)	TCDC instructors	Arusha
	July 1999 - July 2000	CD Advisor	TCDC instructions	Arusha
NGO Capacity building	27/9 - 2/10/98	Education & Community Dev. Advisors (2)	SEACAM and 4H Kange	

Fundraising	22/2 - 26/2/99	Education advisor (1)	Marja Jorgensen - 4H Kange	
Coastal Managers leadership	2001	1 DC, 1 Regional Advisor	WIOMSA/URI	Regional (4 modules in different countries)
Report writing & presentation	Jan 2003 Apr-Jun 2003	Regions/Districts VeMCs, CCCs, EWs, (3 courses)	IUCN-EARO did course for Regions/Districts; Districts did courses for others	Tanga Tanga, Muheza, Pangani
Data processing & analysis	Jan 2004	5 District staff	Consultant	Tanga
Problem analysis, Programme planning and Time management	Feb & May 1995	Programme coord.& Technical Advisors	TCZCDP	Tanga
ICM	June 1994	Programme Coordinator	CRC/URI	USA
	Mar 1999	Advisors (Fish, For, CD & Mariculture)	WIOMSA,URI (CRC) Instructors	Mombasa
Coastal ecology, ICM	18 – 19 May 1995	Programme Coordinators, TAs + 3 Regional Natural Resources Officers	TCZCDP, Massawe	Tanga
	Feb. –Mar 1996	11 Regional staff, District staff (Tanga – 12; Muheza – 12; Pangani –14)	TCZCDP	Tanga
	April 1996 (3 Days)	9 Primary school teachers + 11 Ward, District and Regional Education Officers	TCZCDP, MMP, RNRO.	
	Nov. 1996	DC's, District magistrates, Public prosecutors, other staff (Total 26)	TCZCDP, Reg Advisers	
Coastal ecology	July 1995	All EWs + CRT	TCZCDP	Tanga
	Dec 2001	12 Prosecutors, magistrates, police officers	Regional staff	Tanga
	Sep 2003	10 Prosecutors, magistrates, police officers		Pangani
Boat handling & radio	Oct 1999	6 villagers (Moa)	M. Yasin	
Boat & engine handling and maintenance	2001	16 villagers (2 refresher courses)	Local engine specialist	Villages
Environmental valuation	016/12 - 1417/12/99	Advisers (CK, FU)??	IUCN - EARO TCDC instructors	Arusha
MPA Management	Q3, 2000	4 District staff	WIOMSA, URI/CRC	Malindi, Kenya
Enforcement				
Village Game Scout	Oct-Nov 1996	2 Villagers	Community based Cons. Training institute	Songea
Militia training	Oct-Dec 1997	160 villagers of pilot villages	District militia	
Prosecution course	1998	3 District Enforcement Officers	IDM Mzumbe	
Identification of dynamited fish	July, 1999	20 villagers (Mwambani)	Fisheries officer	
Sea & Land Patrolling	June 2003	3 District enforcement officers, 1 Navy, 1 marine police	TCMP	Dar es Salaam

Reef monitoring				
Reef and fisheries	1998	12 Villagers + 2 district staff	TCZCDP	
Monitoring	April, 1999 Oct 1999 Oct 2001 Feb 2002 Feb 2003 Feb 2004	12 villagers (Mwambani) 12 villagers (Ushongo, Kipumbwi, Kigombe, Mwambani) 12 villagers (Kigombe) 12 villagers (Kigombe) 12 villagers (Tanga) 8 villagers, 4 district staff (Ushongo)	TCZCDP, District Fisheries Staff M.Yasin	In villages
Reef monitoring	Aug 2004 – 2 day refresher	22 VMT and district staff (refresher course)	Kalomb TA	Tanga
Reef Check	March 2003 June 2003	Regional fisheries officer Regional fisheries officer (training of trainers)	Reef Check	Philippines (funded from WIOMSA) Malindi
Alternative income generating activities				
Business Management skills	1996	12 EWs, 6 Villagers	Mwadzaya-Kenya Wildlife Service	Tanga
	Oct. 1996	Tanga CDF recipients	2 Tanga EW	Villages
	Dec. 1996	56 Muheza CDF recipients	2 Muheza EW	Muheza
	Jan. 1997	24 Pangani CDF recipients	2 Pangani EW	Pangani
	Feb 1997	Pangani CDF recipients (Mkwaja)	2 Pangani EW	Mkwaja
Record keeping and accounting	1998	10 KISA users (6M, 4F)	TCZCDP	
Mariculture techniques	Jul-Sept 1996	8EWs, 18 Villagers (general)	Univ. Dar es Salaam	Tanga
	Q4, 1997	25 Women & 3 EW (oysters)	TCZCDP	
	1998/1999	villagers (5 Kijiru, 5 Moa) (seaweed)	TCZCDP	
Fuel efficient stoves	Nov. 1996 (2wks)	13 villagers, 5 EW	Buhuri Agr. & Livestock Tr. Institute	Buhuri
Beekeeping	Dec. 1996	10 Villagers (Kipumbwi, Serewani)	Bwindiki	Pangani
	1998	6 Villagers (4M, 2F)	Bwindiki	
Nursery techniques, Seedling Handling	Feb. 1997	2 Villagers	National Tree Seed Programme	Morogoro
	Q4, 1997	4 villagers - Mwambani, Kigombe and Kipumbwi	National Tree Seed Programme	Morogoro
	1998	3 Mwambani villagers	Mwambani villager trained in Morogoro	
Horticulture & agro-forestry	1998	15 farmers and 3 EW	TCZCDP & District staff	
Organic farming	April 1998 Oct 1998	District agric. linkages (3) and agric. Adviser (1)	KIOF Instructors	Kenya
	Feb 1999	128 villagers (Mwambani, Kig, Kip)	TCZCDP & District staff	
	June 1999	164 villagers (Tongoni)	Ews & District staff	
	Oct., 1999	12 villagers (Tongoni & Ushongo) (vegetables)	Frida & Agric. Linkages	

Improving cassava production	March, 1999	98 villagers (Tongoni & Ushongo)	Frida & Agric. linkages	
Training usasi team in beating techniques	April, 1999	45 villagers (Ushongo & Tongoni)	Frida, Linkages & Ext. Workers	
Vermin control training and study tour (Tongoni)	2000	Moa villagers	Tongoni villagers (chair person vermin control committee)	
Rainwater harvesting	Q3, 1998	Tanga Agriculture Linkage	Workshop	Morogoro
Fish catch data collection (4 introduction and 1 refresher courses)	Aug 2001 Jan/Feb 2002 Mar 2004	Introduction 24 villagers 3 introduction courses, 32 participants 1 refresher course 9 participants (villagers/District)	Regional staff TA	Kigombe Ushongo, Kigombe, Tanga Kipumbwi
Fisheries Data base training	Q4, 2000	6 District staff (2 from each district)	TCZCDP	
Gender	Sept –Oct 1997	Training Adviser	ESAMI Instructor	Harare, Zimbabwe
	Oct 1997	Programme staff (9) (D. Coord. & Advisers)	Claudia	
	11/5 - 15/5/98	District gender and training linkages (6)	Claudia	
	10/6 - 12/6/98	27 EWs	Claudia, Hatibu, Susan, Mfuko	
	15/9 - 18/9/98	DTT and District linkage officers (28)	Claudia, Mfuko, Hatibu, Bwindiki, Stella, Susan, Magreth	
	Oct 1998	6 EWs, DGL(3), DCDL(3), GU, CK (gender profiling)	Edward Mhina & Bertha Mlay	
	Sept., 1999	Gender committees (Kig., Tongoni & Kip.)	District gender linkage officers	
	2000	VEMCs, CCC & vill. govt leaders of Mwarongo-Sahare CMA	District gender linkage	
	March & June 2002	18 councillors/16 DMT members; 125 villagers in 5 villages in Pangani	J. H.Bwindiki	Pangani
Nov 2001	Village committee and governments	Susan Swai	Tanga Municipality	
Monitoring & evaluation	17 – 21 feb 2003.	3 DNROs	IUCN	Nairobi
Sustainable livelihoods	March 2002	8 District staff	RFIS – DFID)	Tanga
Mangrove monitoring	Apr 2003	13 Villagers and District staff	Univ. Dar – 6-day course	Tanga
Socio-economic assessment	May 2003	3 District staff (M.P.T), 6 villagers	SEMP, CORDIO	Tanga
Turtle management	28 29April 2003	24 Villagers, 8 District staff 2 x 2 day courses	Turtle Conservation Project, Mafia	Ushongo & Kipumbwi
Remote sensing	Jun 2004	4 District staff	Sustainable Tanga Project	Tanga
Computer skills	July – Dec.1995(1 hour daily)	Regional & District Coordinators, Adm.Staff.	JK Computer Centre	Tanga

Computer training	28/2 - 21/3/98	3 District accountants, 3 District secretaries, 3 Advisers, 2 Programme secretaries	Precise Computer Centre Instructor	
Refresher computer course	Nov. 2001 2003 Jan 2004	12 Region/District staff 12 Region/District staff 12 Region/District staff	Local consultant	Tanga
Environmental Education	Feb 1998	District education linkages (3) & Ed. Adviser (1)	Elsamere Instructors -	Naivasha Kenya
Coastal Environmental Education	Quarter 4, 1998	33 Teachers and education officers	TCZCDP, MMP	
Coastal ecology & Reef check	Oct.1999	45 youth club members	TCZCDP & M. Yasin	
Participatory Rural Appraisal skills	13 - 17/2/1995	10 EW (SES Surveyors)	TCZCDP	Tanga
Communication skills	14 -15/8/1995	All EWs IT	TCZCDP, Reg Advisers	Tanga
Animation and Facilitation	16 -18/8/1995	ALL + IT	Kalabaka	Tanga
Analysing skills	22 -24/8/1995	ALL + IT	TCZCDP, Reg Advisers	Tanga
Developing Work plans	25/8/1995	ALL	TCZCDP, Reg Advisers	Tanga
Coastal culture	11 -12/ 9/1995	ALL + IT	Siagi Kassim??	Tanga
Feedback and Planning skills	13 -15/9/1995	ALL	TCZCDP, Reg Advisers	Tanga
Feedback on Facillitation,Collaborative resource management	17 -20/10/1995	ALL	TCZCDP, Reg Advisers Kalabaka?.	Tanga

CHAPTER 9: INSTITUTIONAL STRUCTURES AND LONG-TERM SUSTAINABILITY

Solomon Makoloweke and Sue Wells

9.1 Introduction

When the TCZCDP was initiated, Tanzania was in the early stages of transition from policies of centralisation and a planned economy to decentralised decision making and a market economy. The government was still the sole decision making body for natural resource management including fisheries. Virtually all power was held within the then Ministry for Tourism, Natural Resources and Environment, and DoFi had the mandate for management of reef and fisheries resources. The Regional governments directed the Districts to ensure compliance with central government directives, and had their own departments and staff including those for natural resources and fisheries. The Regions were responsible for collating fisheries statistics from the Districts, collecting export taxes from the larger commercial businesses, and could implement programmes, such as the TCZCDP, that covered more than one District. Districts implemented the central and regional government directives, using extension workers based in villages who were responsible for law enforcement, fisheries statistics, fishing gear development, and District tax collection.

In 1996 the Government put in place the Local Government Reform Programme (LGRP) to decentralise decision-making powers and set up democratically elected autonomous local authorities that could deliver effective services within a set of guiding national policies and the national legal framework. Under the LGRP, District Councils control and own natural resources within the area of their jurisdiction, and can enter into partnerships and agreements, thus allowing for a collaborative management approach. It was envisaged that these changes would improve the effectiveness, accountability and transparency of natural resource management and at the same time reduce government expenditure. The Regional government now plays an advisory role.

Mainland Tanzania thus has two levels of government: (1) Central Government: Ministries, Regional Commissioner's Office, District Commissioner's Office and Divisional Offices; and (2) Local Government: District Councils, Wards and Villages. The MNRT, the principal Ministry relevant to the TCZCDP, has five divisions: Fisheries, Forestry and Beekeeping, Wildlife, Tourism, and Antiquities, and oversees policy and legal aspects of these resources. A distinctive feature of the government structure is the lack of a line of governance between central and lower levels of government, as the sectoral Ministries have to instruct Regions and Districts through the Ministry for Regional Administration and Local Government. Districts, wards and villages are headed by elected councils. Unlike the Regional Government, District and Village Councils have the power to make by-laws.

A major activity of the TCZCDP has been to develop institutional arrangements that are mainstreamed into statutory government structures, and to ensure that decentralisation took place without compromising coastal management objectives and whilst promoting the collaborative management approach. Lewis and Juma (2005) list the main steps to be taken in mainstreaming the TCZCDP as:

- Introducing a sustainable participatory planning process at community level, that complies with the officially accepted ‘Opportunity and Obstacle to Development Planning’ (O&ODP) system, now used by the government
- Integrating coastal management activities into the District Development Plans
- Ensuring that the Regional Administration has a sustainable process in place for reviewing coastal management
- Setting up mechanisms to allocate and disburse funds through the National Treasury to the District treasuries and from there to field staff
- Integrating funding for coastal management into the District accounting and auditing systems.

Ensuring financial sustainability of coastal management activities, with minimal donor assistance, has also been a goal of the TCZCDP since Phase I. This requires:

- increased revenue generation for the Districts, through effective collection of taxes and fees from activities such as fisheries and sustainable mangrove utilisation
- revenue sharing schemes with communities, so that they have both resources for management activities as well as incentives for careful resource utilisation
- An ability to raise funds from external sources, i.e. skills in proposal writing for donors.

This chapter describes first the work undertaken by the TCZCDP to develop an appropriate institutional structure, and secondly investigates potential mechanisms for financial sustainability.

9.2 Institutional arrangements

9.2.1. Districts

The Ministry of Regional Administration and Local Government, through the LGRP, lays out the structure for local government. The DED is the Chief Executive of the District and is an employee of the President’s Office of Regional Administration and Local Government (PORALG), which handles all matters relating to regional and local government. The District Commissioner is a political appointee designated by the President. The District Council Chairman is a locally elected official and leads the other District councillors elected to the District Council. Each Department Head (e.g. Natural Resources, Health, Education) is a member of the Council Management Team (CMT), which is chaired by the DED and reports to the District Council on all District matters. Co-ordination occurs through Standing Committees, such as the Finance and Planning Committee, and through meetings of the District Council, usually twice a year. Heads of Departments are advisers to different Standing Committees depending on their expertise, and can also be co-opted on to one or more of these Committees. District to central government institutional arrangements are illustrated in Figure 9 1b.

The implementation of the LGRP within each District involves 17 defined steps that progressively build the capacity of the Districts to carry out their responsibilities. Each step involves a change in organisational structure and management systems to improve delivery of services. Each District is at a different stage of both the LGRP and of mainstreaming its coastal management programmes:

- Tanga is now in step 17 of the LGRP and has the mandate to make its own decisions and to appoint its own personnel. It has a strategic development plan (2005). Natural resources are categorised with agriculture and livestock.

- Muheza is only in step 1 of the LGRP. It has a 3-year strategic plan (2003-2005) that includes coastal and marine resource management, but for which there is inadequate funding; natural resources are categorised with agriculture, livestock, lands and co-operatives.
- Pangani is not yet incorporated in the LGRP, and its annual plans are still produced according to central government guidelines; natural resources are considered as a supporting service to the priority areas of agriculture, education, water, health and works.

The core activities of the TCZCDP (i.e. CMA planning, reef monitoring and enforcement) are seen as activities of the Natural Resource Departments and are being mainstreamed into the District Development Plans and the District Natural Resource Plans. However, natural resources are not considered a high priority in any of the three Districts (Kamukala, 2003). The main role of the Districts in the implementation of collaborative management activities, such as the CMAPs and mangrove management plans, is to provide technical and financial support. The CMT plays a key-role and, in the context of coastal management, is essentially the District ICM Committee, a body recommended in the national ICM strategy (see below). Intended to comprise an inter-sectoral team of technical experts, the CMT is expected to discuss ICZM plans before they go to the Standing Committees, ensure sharing of information between technical staff, and to facilitate reviews of the plans. The Standing Committees (whose names differ in different Districts) discuss the plans and make recommendations for their submission to the District Council. The District Council approves the plans and accompanying by-laws and sends recommendations to Fisheries or Forestry for final approval of plans; it should then provide financial, technical and material support for implementation of plans. The District Officers for Natural Resources, Fisheries, Forestry (mangroves) are responsible for facilitating preparation and review of plans, monitoring and data collection, as well as collecting levies and license fees and enforcing national legislation for their sectors. Table 9.1 shows the District staff involved in coastal management activities. The evolution of institutional arrangements for coastal management at District level, as described by Lewis and Kamukala (2000) is described in Box 9.1.



Box 9.1. Evolution of District institutional arrangements

The institutional arrangements for coastal management at the District level evolved through a process of adaptive management over the course of the TCZCDP.

Phase I

The TCZCDP started through discussions with Tanga Region, at the Regional Development Committee. The District representatives on the Committee were reluctant to take on such an initiative, and so the Region formed a temporary Task Force to identify an appropriate arrangement. This was to set up District Technical Teams (DTTs) within the DMT (now CMT) as the main programme bodies. The DTTs were chaired by the DED, and comprised representatives (usually the Heads) of all Departments involved in coastal management such as natural resources, education, planning, community development and agriculture. Although not statutory bodies, the DTTs played an important role initially in promoting integration of the different sectors; they also made the quarterly work plans, attended village action planning meetings and played a supervisory role. A District Steering Committee was set up as an inter-sectoral forum, comprising Coastal Ward Councillors, two representatives of each pilot village (one man/one woman), and the entire DTT; it was chaired by the chair of the District Council/Mayor of Tanga Municipal and met every quarter.

A District Co-ordinator (DC) (not a statutory position) was appointed in each District from an existing position, e.g. Natural Resources, Planning or Fisheries Officer. The DCs co-ordinated TCZCDP activities at District level and liaised with Regional staff; they supported and reported to the DNRO, who was the key focal point in each District. The other key government officials were the field extension workers in community development, fisheries, agriculture, and forestry who provided the link between the government and local communities and facilitated day-to-day management activities such as patrolling.

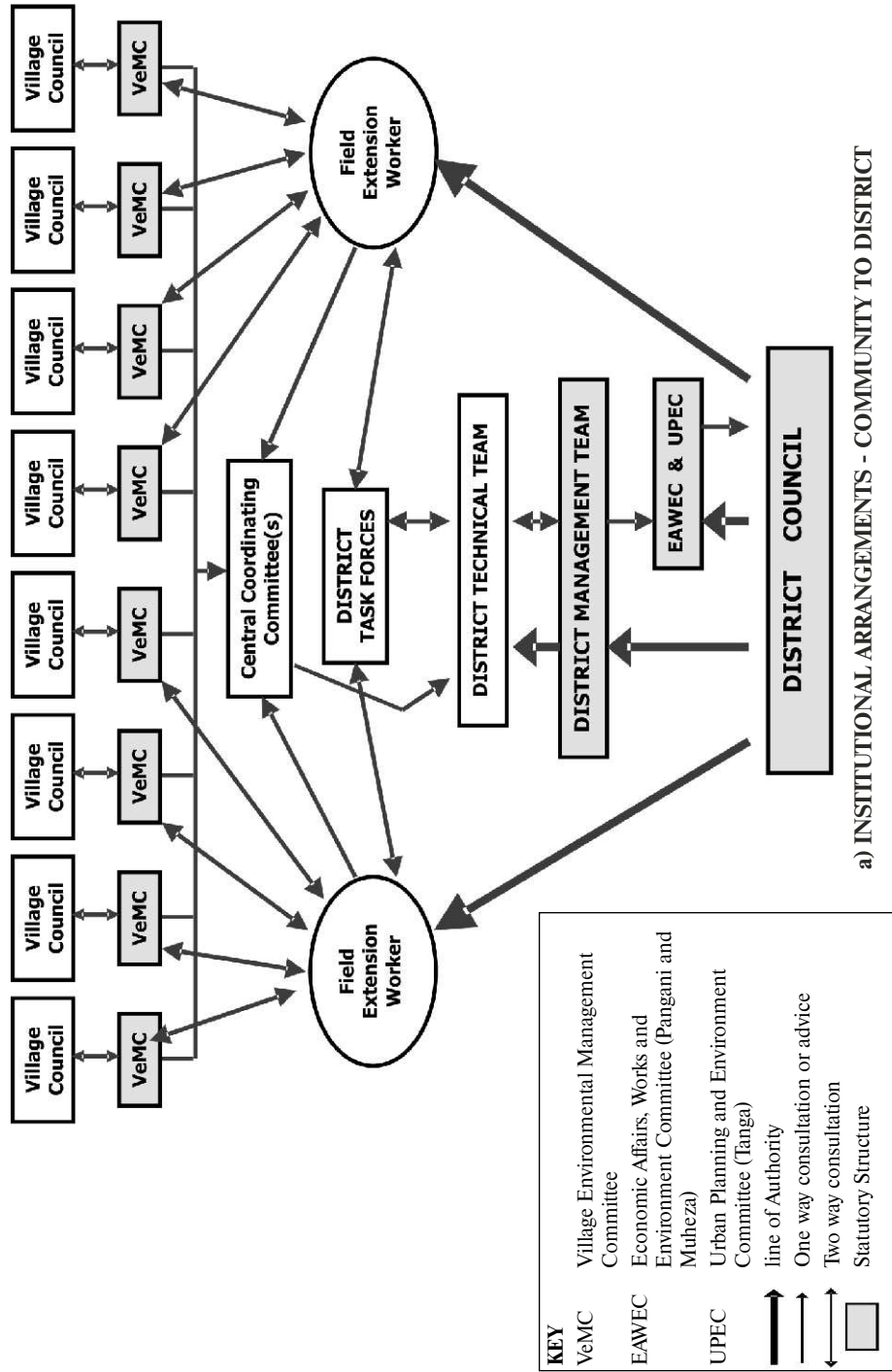
Phase II

District Task Forces (DTFs) were set up responsible for planning, implementation, monitoring and reporting to the DTT and DMT. District linkages were established to link the District and the Regional head of each sector. Through a consultancy, an overall institutional structure was proposed to main stream coastal management in accordance with the LGRP (Lewis and Kamukala, 2000). The District Steering Committees were dissolved, and the Programme reported directly to the relevant District Standing Committees. The Inter-district Task Force was disbanded at the beginning of Phase III.

Phase III

The DTTs and DTFs were disbanded and their functions integrated into statutory District structures. The concept of District 'linkage' was also dropped with existing staff positions taking over their functions. In line with the national ICZM strategy, the DMT started to be referred to as the District ICZM Committee when discussing ICZM activities. During this phase, the DC was absorbed into the DNRO position where possible.

Figure 9.1. Organogram showing institutional arrangements from a) village to the District b) District to Central government (Source: Lewis and Kamukata, 2000). The inversion of the traditional top-to-bottom flow of an organigram is intentional. It underscores that TCZCDP institutions need to be organised to ensure maximum impact at the field level.



b) INSTITUTIONAL ARRANGEMENTS - DISTRICT TO CENTRAL GOVERNMENT

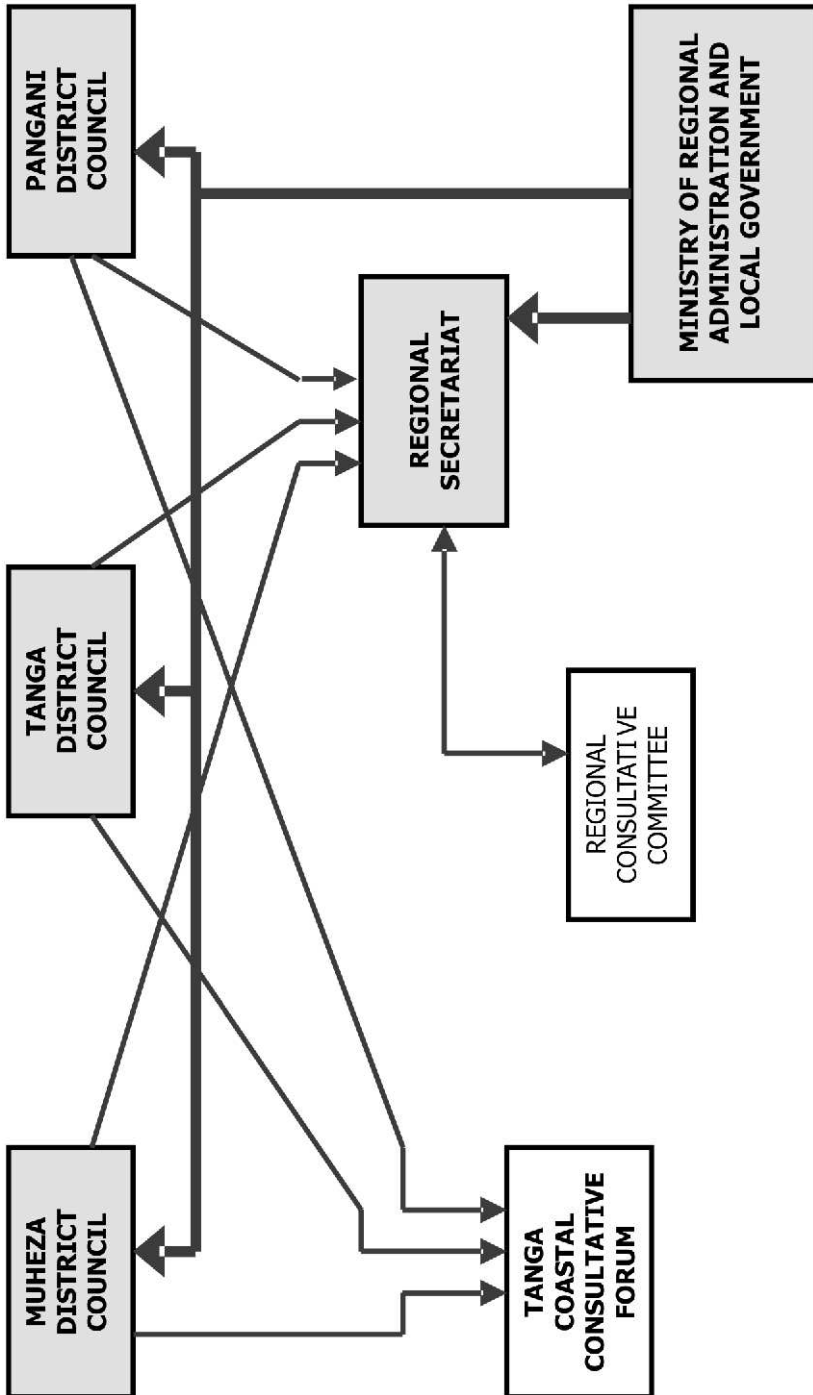


Table 9.1. District staff involved in the TCZCDP in 2004 (Source: Kamukala, 2004)

	Muheza	Tanga	Pangani
District Natural Resources Officer	1	1	1
District Fisheries Officer reef monitoring coordinator	1		
District Planning Officer			1
District Fisheries Officer	1	1	1
District Forestry Officer		1	1
District Enforcement Officer	1	1	
District Beekeeping Officer	1		1
Extension Officers - Agriculture	3	1	
Extension Officers Community Development	2	1	
Extension Officers - Forestry	1		
Extension Officers Fishery	1		
Inter-sectoral Linkage agriculture			1
Inter-sectoral linkage - tourism			1
Inter-sectoral linkage - antiquities			1
Total	12	6	7

9.2.2. Inter-District co-ordination arrangements

It was recognised early in the process of decentralisation that it would be important to establish mechanisms to ensure adequate co-ordination between the Districts so that approaches to planning, implementation and enforcement could be standardised where necessary (e.g. reef monitoring), and information shared and problems discussed. For example, the GIS trained staff in the Tanga Municipal planning department are assisting the other Districts and the Region to produce maps of use for coastal management. In the case of the two CMAs (DeepSea Boma and Mtang'ata) that cross District boundaries and lie within both Tanga and Muheza Districts, the need for co-ordination goes beyond simple information sharing, as the Districts have to share the financing for these two CMAs (Kamukala, 2003).

Co-ordination was initially achieved through the various formal and informal meetings between staff that the TCZCDP held at regular intervals, aided by the fact that all three Districts have been involved from the beginning. Monthly co-ordination meetings are now held at which the DCs and DNROs discuss issues relating to implementation, review progress and find solutions for problems with the Regional Fisheries Adviser (RFA) and other officers according to need. It remains to be seen whether these regular meetings will be sustained now that external support for the TCZCDP has ended, but there is optimism given the long history of joint work on the Programme.

9.2.3. Village and inter-village institutional arrangements

Villages are headed by elected Village Councils (or ‘governments’) consisting of a Chair and elected members. They approve plans, pass and enforce by-laws, review reports and act on issues. Issues raised at village level are forwarded to the Ward and then onto the District if necessary; any work done in villages should be cleared first with the District government. The Village Council should also set up statutory Village Standing Committees (normally planning and finance, security and defence, and social affairs). The TCZCDP and other environment projects in the country, such as the Duru Haitemba community based forest conservation project in Babati, promoted the establishment of VeMCs which are responsible for environment activities, and can initiate village coastal management plans, propose by-laws, monitor and co-ordinate activities in the plans, and prepare monthly reports for the Village Council. Village to District institutional arrangements are illustrated in Figure 9.1a.

As described in Chapter 4, a Central Co-ordinating Committee (CCC) is established for each CMA which, although not a statutory body, is legally recognised through a District by-law. The CCCs are made up of representatives from the VeMCs of each village within the CMA; the size varies depending on the number of villages involved. Agreements are drawn up, as part of the CMA planning process, between (a) the relevant Districts and the VeMCs, (b) the Districts and the Village Councils, and (c) the Districts and the CCCs (see Figure 9.1a). The TORs for the VeMCs and the CCCs should be attached to the CMAPs although this has not yet been done. Some villages are involved in more than one plan. For example, both the Mtang’ata Plan and the Mwarongo-Sahare Plan include the villages of Mwarongo, Geza, Tongoni and Maere. The village representative involved in each case sits on both CCCs.

Box 9.2. Evolution of institutional arrangements at village level (see also Figure 9.1a)

Phase I: Issue-based environmental management committees were established in the three pilot villages, in addition to the Mangrove Management Committees set up by MMP, to reflect the seven priority issues the villages had identified (i.e. declining fish catches, beach erosion, vermin control, mangroves & tree planting etc). Kigombe, for example, had committees for patrolling, mangroves and tree planting, and beach erosion and vermin control. The members were selected at village meetings. The TORs required that they prepare quarterly work plans, and call meetings with villagers to discuss progress and develop new quarterly workplans.

Phase II: When additional villages were brought in, the number of environmental committees was reduced to two, or in most cases one VeMC that, where necessary, was integrated with the pre-existing Mangrove Management Committee. Separate gender committees were established in some villages. Formal procedures for selection of committee members were established. The initial neighborhood meetings to discuss inter-village issues gradually evolved into the CCCs.

Phase III: Consolidation of current arrangements (see main text).

9.2.4. Wards

At the sub-District level, villages are grouped into Wards, each with a Ward Development Committee (WDC), headed by a Ward Councillor and with the Ward Executive Officer as secretary. During the pilot village stage, Wards were not involved in the TCZCDP, but once the multi-village approach was adopted this governance level became important. Village and CCC plans and by-laws now have to pass through the WDC.

9.2.5. Regional Administration

The Tanga Regional Administration plays an important advisory and facilitating role in helping the Districts to implement national policies. The roles of a Region, as defined under the LGRP, are to:

- Offer multi-skilled technical support, and advisory and facilitation services to the Districts so that they can deliver their services efficiently and effectively
- Ensure peace and tranquillity for the regional inhabitants to enable them to pursue their goals whilst acting as an extended arm of Central Government
- Provide capacity building and technical input to the Districts if requested. Each year the Region prepares a Capacity Building Plan, in which the Districts' technical requirements and solutions and/or sources for solutions are identified
- Monitor the performance of the District using performance standards and indicators (although these have not all be finalised).

Restructuring and redefinition of the Region's role took place over the course of the TCZCDP, principally at the end of Phase II and during Phase III (Box 9.3). The Regional government now consists of a small Regional Secretariat (RS) headed by a Regional Commissioner, with a Regional Administrative Secretary (RAS) (originally known as the Regional Development Director), and a Regional Fisheries Adviser (RFA). The original Regional Development Committee has been replaced by the Regional Consultative Committee (RCC) which has an advisory role (see Figure 9.1b). The role of the Regional Management Team has been taken over by RS quarterly meetings. The RS screens District Plans including the CMAPs to ensure they are in line with national policies, and provides advice. Co-ordination meetings are held each month with DNROs and the RFA. Regional governments must be kept informed of activities within their jurisdiction. The Regional Police Commander through the Marine Police Unit assists with arrests and prosecution and support patrols.

The Tanga Coastal Consultative Forum (TCCF) was established in 2002 to provide administrative and technical facilitation to the Districts on issues concerning coastal management and to act as a link between the Districts, the central government and other national or international institutions. It is not a statutory body but has important functions in terms of ensuring integration of sectors and co-ordination between stakeholders, as follows:

1. Advise the three Councils on substantive issues of coastal resource management and sustainable use, community participation, government reforms, policies and legislation, enforcement and economic development.
2. Facilitate conflict resolution of inter-District issues and address common problems transcending District boundaries.
3. Harmonise District policies and by-laws relating to coastal zone management.
4. Provide a forum for sharing information and experiences across Districts.

5. Facilitate cooperation between the TCZCDP, Districts, the Region and other national and international institutions on issues of coastal zone management.
6. Receive TCZCDP workplans and progress reports for comment.

As such the TCCF was used by the Programme in lieu of the Regional Steering Committee to review progress and receive stakeholder input to the Programme (see Box 9.3). Membership of the TCCF comprises the: RAS (as Chairperson), RFA (as Secretary), Pangani and Muheza DEDs, Tanga City Director, the three DCs and/or DNROs, one Councillor from each District (preferably the Council Chairperson), two Community representatives from each District, private sector representative(s), representatives of the MNRT and NEMC, and additional technical staff as invited. The private sector is represented by individuals from hotels near Pangani, one of the salt companies, one of the seaweed development companies, and the seafood processing company SPL. IUCN - EARO and Irish Aid participated in the TCCF when involved in the TCZCDP. Meetings are held on a six-monthly basis or more frequently if deemed necessary by the Chair, and are convened by the RS and organised by the RFA.

DEDs, Tanga City Director, the three DCs and/or DNROs, one Councillor from each District (preferably the Council Chairperson), two Community representatives from each District, private sector representative(s), representatives of the MNRT and NEMC, and

Box 9.3. Evolution of institutional arrangements at the Regional level (see also Figure 9.1b)

Phase I: The Regional Fisheries Officer was appointed Programme Co-ordinator. Five Regional staff were seconded to the TCZCDP as Coordinators for Community Development, Awareness & Training, Coral Reefs and Fisheries, Forestry, and Mariculture; they were re-named Regional Advisers in Phase II. A Regional Steering Committee was established with the RAS as chair, and the DEDs, IUCN, and the donor as members, as a separate oversight body. The IUCN CTA and Regional Programme Co-ordinator formed the secretariat, and the DCs and other Regional Coordinators sat on it as observers. Initially, a Regional Stakeholders Workshop or forum was held each year with representatives from different levels and sectors (Ministry, District, village, Region, private sector). To provide co-ordination between the Region and Districts, a Regional Coastal Environment and Conservation Committee was set up, chaired by the RAS and with sub-committees on Enforcement and Mariculture but this met only once.

Phase II: Two additional Regional Advisers (Agriculture and Education) were added, making a total of seven. The Steering Committee was enlarged to include representatives of NEMC (represented by TCMP) and the MNRT. The Regional Advisers were transferred back to the Districts towards the end of this Phase.

Phase III: The Programme Coordinator was made the Regional Coastal Management Facilitator (RCMF) and current arrangements for the involvement of the Region in the Programme were developed (see main text). The Regional Steering Committee was disbanded when the TCCF was established. External technical assistance was consolidated within a 'Support Unit'.

Phase IV: At the end of Phase III, the need for a small executive committee to discuss issues related to the donor funding was identified and a new Programme Steering Committee, chaired by the RAS, was set up in 2004. This was disbanded in 2007 when donor funding ended. The RCMF was renamed RFA, and made Programme Manager for the remaining years following the departure of IUCN-EARO. The Support Unit was replaced with an equivalent team staffed and managed by the RS.

additional technical staff as invited. The private sector is represented by individuals from hotels near Pangani, one of the salt companies, one of the seaweed development companies, and the seafood processing company SPL, IUCN - EARO and Irish Aid participated in the TCCF when involved in the TCZCDP. Meetings are held on a six-monthly basis or more frequently if deemed necessary by the Chair, and are convened by the RS and organised by the RFA. Since 2004, the Districts have chaired the TCCF on a rotational basis.

Table 9.2. Relationships of the TCZCDP with national institutions.

National Institution	Role in relation to TCZCDP	MOUs and agreements
Fisheries Division	Gives final approval to CMAPs; develops fisheries policy and legislation and fisheries development plan (10-yr master plan), and provides financial support.	
Vice President's Office (VPO) Department of Environment, NEMC and TCMP	TCZCDP participated in many TCMP working groups and was actively involved in the formulation of national guidelines and strategies (e.g. District ICM Action Plan guidelines, national ICM Strategy); TCMP provides a forum for information exchange and is supporting the development of pilot ICM plans in three Districts including Pangani (see Chapter 4). Provides GIS support and training.	No formal agreement, but TCMP sits on the TCCF.
IMS/University of Dar es Salaam	IMS provides scientific support, and calibrates reef monitoring; UDSM has undertaken consultancies such as the Phase I mariculture consultancy.	IMS, through UDSM, has an MOU with the Region on behalf of the Districts.
Division of Forestry and Bee-Keeping	Gives final approval to mangrove management plans, develops forest policy and legislation and provides technical support for mangrove management; potentially provides financial support through revenue sharing.	MOU with each District concerning collaboration between TCZCDP and MMP.
Ministry of Home Affairs Marine Police	Law enforcement, investigation and prosecution.	
Ministry of Defence - Navy	Provided Navy Support to enforcement with placement of personnel at patrol bases, though this was disbanded in 2005 (see Chapter 5)	MoU with the Region.
Marine Parks and Reserves Unit (MPRU)	Responsible for Maziwe Marine Reserve. Its management was entrusted to TCZCDP (Chapter 4)	MoU with Pangani District Council.
TANAPA	Responsible for the management of the recently gazetted Saadani National Park which includes a marine component.	Collaborative management of Fungu Buyuni closed area.

9.2.6. National level

During Phase I, technical workshops included representatives from national institutions, but relatively little effort was put into developing links with these bodies. In Phase II, the importance of this began to be appreciated and closer links were developed with DoFi and the Division of Forestry and Beekeeping. Relationships were gradually developed with other national institutions, often supported by MoUs, as shown in Table 9.2. Links with national institutions are generally considered to be weak and Kamukala (2004) recommended developing a closer relationship with TCMP in particular. As described in Chapter 4, there is a need to look at both the CMAPs and the collaborative mangrove management plans in relation to the District ICM plans that are recommended under the National Integrated Coastal Environment Management Strategy, and that are being piloted in other Districts by TCMP (Torell *et al.*, 2002).

9.3. Financing coastal management

The primary sources of funding for the TCZCDP until 2007 have been the Government (salaries of District and Region personnel) and the donor, Irish Aid. Other contributions have included in-kind contributions from the villages, District, Regional and Central governments, Navy and marine police (for enforcement), MPRU (for management of Maziwe Reserve), TCMP (Coastal Environment Award Scheme (CEAS) for World Environmental Day celebrations), and WIOMSA (grants for seaweed farming trials and travel, for example to Second



Integrated Tropical Marine Ecosystems Management Symposium (ITMEMS) and International Coral Reef Symposium (ICRS) in Phase III).

The current commitments from these sources and the Government is well below the costs involved in running the Programme so financing core activities now that donor funding has ended remains a matter of concern. In Phase III, for example, the total contribution by Communities, Districts/Municipal Councils, MPRU, and the retention fund from DoFi averaged Tsh 8 million year, but it is estimated that the cost of managing the six CMAs is about Tsh 175-200 million a year. Funding needed includes costs for the following activities:

- Reviewing management plans - meetings/travel
- Feedback on progress (plans, monitoring, surveys, data) to CCCs meetings and travel
- Administrative costs for implementation office stationary etc both at District and village level
- Enforcement - patrols
- Equipment for monitoring, boats, vehicles, engines
- Hiring of technical expertise
- Monitoring of reefs, mangroves, seaweed farming, gender, socio-economic factors
- Environment education

The various sources involved to date and their potential as sources in the future are discussed in more detail below.

9.3.1. Donor Funding

Irish Aid funded the TCZCDP for over 12 years as follows (at 2007 rates of exchange), an average of US\$2.4 million for each Phase, or US\$800,000 a year.

Phase 1: 1994-1997	(3,052,000 SFR)		US\$ 2.5 million
Phase 2: 1997-2000	(IR£ 1,759,250	c. €2,235,387)	US\$ 3.0 million
Phase 3: 2001-2003	(IR£ 1,463,621	c. €1,859,747)	US\$ 2.5 million
Phase 4: 2004-2007	(€ 1,202,668)		US\$ 1.6 million

Donor funding covered technical assistance, equipment, training, monitoring and evaluation, certain local personnel costs, operating costs and the IUCN management fee. In Phase I, expatriate technical assistance accounted for about 50% of the budget; by the end of Phase II, this had dropped to about 25% of the budget. Permanent external technical assistance ceased in the first year of Phase IV and was provided on a consultancy basis when the Districts requested it. Topping-up allowances for District and Region staff were stopped in line with the formal agreement by donors and the Government of Tanzania in 1999.

The Phase III evaluation considered that the TCZCDP was very cost-effective compared with many donor-funded activities in Tanzania. The Programme estimated that donor investment during Phase III represented about US\$2-3 a year per person in Tanga Region, compared with the average per capita investment in Tanzania from overseas aid of US\$29 (Phase III evaluation report). The disbursements followed the recommended pattern for donor funding, with a smaller tranche at the beginning of the project, a larger tranche once the project was up and running, and then a gradual decrease towards the end of the project.

Donor funding is likely to continue to be needed for a considerable time in the future. The District Councils have the autonomy to seek donor assistance, but need to develop their fundraising skills. They are also able to seek technical assistance in kind from both national agencies and the Region.

9.3.2. District contributions

From the beginning the TCZCDP encouraged in-kind and financial contributions from both the Region and each District. The Districts receive direct funds from the Treasury for priority sectors including agriculture, education, health, roads and water, the budgets of which are approved by Parliament. For development sectors, including natural resources and land, the Districts are expected to provide the necessary financial resources themselves. A District prepares a budget indicating whether funding is from its own sources or other sources such as donors, and after being screened by the RS, this is submitted to PORALG for approval. Salaries of government staff are paid by the District Councils, which thus cover the time spent by District officers on TCZCDP activities, but field per diem allowances have to date been paid by the TCZCDP²¹.

²¹ District officers receive Tsh 15,000 (full per diem) and Tsh 7,500 (half per diem); drivers receive Tsh 10,000 (full per diem) and Tsh 5,000 (half per diem)

Table 9.3 District contributions to the TCZCDP in Phase III in terms of % development budget and financial contribution (Tsh). Source: Phase III final report; figures not available for % development budget in 2003.

	2001		2002		2003	
	Planned	Actual	Planned	Actual	Planned	Actual
Tanga	6.5%	6.0% 2,072,870 Tsh	10.0%	11.6% 4,980,000 Tsh	15.0	6,000,000 Tsh
Muheza	4.0%	2.4% 1,634,000 Tsh	8.0%	1.6% 1,200,000 Tsh	12.0	0.0% 0 Tsh
Pangani	2.0%	1.7% 1,009,790 Tsh	5.0%	1.0% 874,150 Tsh	10.0	66,000 Tsh

Contributions from each District gradually increased throughout the Programme, as follows:

Phase I: The Region and Districts contributed personnel and buildings, and the Region contributed one 25 HP Yamaha outboard engine.

Phase II: In September 1998, the Districts started to contribute fuel (about 100-200 litres a month each) for the joint patrols. They were encouraged to keep receipts and to calculate how much the fuel was worth in financial terms. At the end of this phase, criteria were developed for determining a graduated % financial contribution to TCZCDP activities.

Phase III: Districts continued to contribute fuel for marine patrols (c. 200 litres of petrol and four litres of oil a month). In addition, financial contributions were built into the MoUs between each District and Irish Aid, with each District expected to set funds aside for coastal management in its overall development budget. The contributions were planned to increase gradually over the three years and were estimated in relation to financial ability, with Pangani pledging less (from 2% in 2001, to 10% in 2003) and Tanga more (from 6.5% in 2001 to 15% in 2003) (Table 9.3). Financial transfers were made to the TCZCDP bank account, but revenue came in erratically and in low amounts as the Councils had other financial obligations. Tanga met its targets, largely because, as the largest centre in the region, it is able to levy considerable revenue. The other two Districts performed less well, particularly Pangani where hospitals and schools were a greater priority. Another obstacle was the removal in 2001 of the development levy, and in 2004 of ‘nuisance’ taxes kodi kero (e.g. bicycle ‘cards’ and taxes on businesses with turnover of less than 20 mill. Tshs) which reduced direct income to the Districts. During Phase III, each District contributed Tsh 1 million to the setting up the Regional Resource Centre²².

Phase IV: From 2004 Districts no longer contributed graduated cash contributions to the TCZCDP account, but budgeted activities within their own workplans. In each District, a budget line was established for enforcement activities and reef and fisheries monitoring. District plans and budgets were brought into line with government cycles (July-June, rather than the TCZCDP cycle of January-December). In the financial year 2005-2006, Tanga City contributed Tsh 5 mill for sea and land patrols, monitoring of fish catch, reefs and mangroves, and socio-economic factors; capacity building and Programme management. Figures are not

²² It is not known if this is included in, or in addition to, the figures shown in Table 9.3.

available for the other Districts. Several contributions are 'in-kind', although financial contributions are needed for many key activities, such as hosting meetings of the TCCF, and therefore now that donor funding has ended these funds need to be found.

There is considerable scope for the Districts to raise funding for coastal management activities. Under the Local Government (Finance) Act No. 9 of 1982, Districts can collect revenue in a number of ways (Shauri, 2003b) including:

1. Taxes levied on trade activities such as sale of fish, prawns, octopus, seaweeds, salt, and sand that has been mined; the revenue is collected by village and Ward officials or by the DNRO.
2. Taxes levied on exports (export levies); these are paid to Central Government but are subject to a retention scheme by which a percentage is returned to the District from which it is collected. Under the DoFi retention scheme, the TCZCDP received Tsh 2 million in 2001, and Tsh 786,000 in 2003²³.
3. Taxes levied on fish catches (ushuru; 5% of landed value of each fisher); these are paid directly to the District Revenue Accountant and can be used as the District wishes (see section 9.3.3);
4. Licences paid by fishers, boat owners and small businesses; these go directly to the District and can be used at its discretion. Licence fees are frequently evaded for example, a total of 46 fishers should have paid licence fees in Pangani in 2002, but by July of that year only 18 (39%) had paid, due to lack of cash (Jambiya, 2002).

Feasibility studies carried out in Phase II suggested that there would be potential for raising greater revenue from fishing and mangroves, and the fisheries option was explored further in Phase III (see below).

9.3.3. Fisheries Revenue

Revenue from fisheries, although small, should be destined for fishery management activities but at present it goes to the District's general treasury and is used as any other District funds, not necessarily on fisheries related matters. The Fisheries Act provides guidelines on the (i) licences and fees for fishers and fishing vessels, and (ii) taxes to be collected on marine resources. The central government handles licence fees for vessels over 11m long and local government is mandated to handle smaller vessels and local fishers. No particular mechanism is stipulated for registration and collection and there is a certain amount of latitude to design licensing systems to cater to specific needs (Hurd *et al.*, 2003).

Catch levies are collected at the landing sites (two in Muheza, four in Pangani and three in Tanga) whenever fishers bring in their catch. As with most local government taxes, catch levies are often evaded, and there is considerable 'leakage'. Specific problems with the system include the many official landing sites, with fishers arriving at different times of day, insufficient revenue collectors to cover all sites and times, the landing of catches at unofficial sites, seasonal fluctuations in fish catches, migrant fishers, and under declaration on the part of the revenue

²³ Retention schemes are short-term (3 years) arrangements to facilitate the reinvestment of funds in the sector from which revenue is collected, with the aim of generating further revenues from that same sector. Should a sector operating a retention scheme show improved revenue generation, the arrangement can be extended. In the case of fisheries, the scheme started in 1997 and revenues and degree of retention are such that the Fisheries Department receives no further budget allocation from consolidated treasury funds (Wilson, 2004).

collectors. A TCZCDP study (Horrill *et al.*, 1997) to look at the issue estimated that in the 1990s only about 25% of potential revenue was being collected and that there were many problems with accountability; supporting receipts were often missing or did not match the amount collected and there was inconsistency in the procedures with fishers. A second study (Horrill, 2001) found that in all three Districts revenue from fish catch levy was falling suggesting the problem of poor revenue collection was escalating not improving.

Increasing the number and quality of revenue collection officers would be difficult, given the budgetary constraints and capping of further employment in government. Since the LGRP encourages District Councils to use outsourcing to improve service delivery, Tanga City attempted privatisation of revenue collection for two of its landing sites, DeepSea and Sahare. Private collectors were hired through a competitive tendering system but proved to be no more successful than the government collectors.

The introduction of a permit system was investigated in detail by the TCZCDP as a potential option for improving revenue collection (Horrill, 2001, Jambiya, 2002). The TCZCDP estimated that with a permit system, at minimum 15-20% more revenue could be collected without changing the amount that individual fishers have to pay. The difference is that under the permit system, the levy is paid in advance, and the price is based on an estimate of the predicted catch. Payment in advance, through a permit, is easier to implement and enforce as:

- Permits will be purchased by boat owners (i.e. payment will be made by the same person currently expected to pay the fish catch levy), and so fishing vessels will be required to have a fish catch levy permit, as well as a vessel licence
- The price of a permit will depend on the gear used on the boat (not on crew size, individuals etc)
- Permits would be sold on a monthly or quarterly basis by DoFi offices, or fisheries extension officers in villages (and potentially through BMUs)
- Enforcement will be through the existing patrol system, boat registration system, and periodic inspections of condition of boat and gear

There was general acceptance by the Districts that the permit system is worth testing further, and all were willing to use the increased revenue for coastal management. There was also national support for the approach from DoFi, since revenue will be increased and collection will be easier, reflecting efforts underway to reduce the complexity of the collection system. It was hoped that the LGRP would be supportive of the concept.

Fishers are less happy with the permit system proposal as they will have to pay 'up-front' and often do not have the cash to do so; evasion of payment would also be more difficult. Revenue collectors were also unspoken unsupportive as clearly it puts their unofficial 'income' at risk. In addition, it is unclear how a permit system could be applied to the Zanzibar fishers who use the CMAs, and who will have paid their vessel and gear licences elsewhere, although selling their fish in Tanga. Further analysis would be needed to determine whether the savings made in reducing the number of revenue collectors and the time they spend visiting landing sites will outweigh the costs involved in issuing permits (Jambiya, 2002). Permit costs will need to be harmonised between the Districts so that there is no incentive for fishers to try and obtain their permits in the cheapest District. It is suggested that a quarterly permit would be most cost-effective, although fishers would prefer a monthly one. It was recognised that plans for changing the levy system must be based on the 2002 manual Reforming Local Government Finances in Tanzania (Jambiya, 2002).

As a result of these potential obstacles, a pilot trial in Pangani was planned for Phase IV. Pangani District was selected for the trial as there is less fishing pressure and little overlap of resource users (the Pangani River provides a barrier to the north, and Saadani National Park a similar barrier to the south). It was also felt that an awareness raising campaign would be essential to explain the need for a new system. With the help of consultants (Environmental Liaison Centre International), a proposal for an awareness raising campaign was developed in early 2005, and posters, brochures, T-shirts, caps, a video and other mechanisms were developed.

Piloting of the permit system has been delayed for several reasons. It was felt best to wait until after the General Election in December 2005, so that the new councillors would understand the rationale for the new system that they would be expected to support. Secondly, it was felt that the trial should not overlap with the introduction of new seaworthy certificates for vessels by the Ministry of Transport and Communications, as this could have been confusing. To date, neither the awareness campaign nor the trial has been undertaken. If the Pangani trial works, it is expected to be relatively easy to convince the other Districts of the value of a permit system.

9.3.4. Village contributions

There is scope for local communities to contribute to the financing of coastal management activities. Several coastal villages have been contributing in kind, in the form of kerosene (about 20 litres a month), fuelwood and fresh water for the Navy participants of the patrols; for the year 2003 the total monetary cost of these community contributions for all three Districts was estimated at Tsh 840,000 (Phase III final report). Villagers can collect revenue under their own by-laws and may establish agreements to retain up to 10%, although so far no community has introduced such a system.

Some of the CCCs are thinking about possible financing mechanisms. The CCC for Mtang'ata CMA has required each of the five villages in the CMA to contribute Tsh 5,800 a month for management, which was contributed only by Kigombe village up until the Navy withdrew in 2004. The CCC of DeepSea Boma CMA has called for a meeting with the District Councils to discuss the feasibility of setting up a DeepSea Boma Fund (Kamukala, 2004).

9.3.5. Regional Administration contributions

Potentially, the Regional Administration could make funding available but it has minimal funds for coastal management activities within its budget for natural resources, fisheries, agriculture, co-operatives and trade. Under the Medium Term Expenditure Framework, objectives and targets must be defined and the accounting officer has to account for how funds were spent in relation to the objectives. However, the funds available rarely match the budget. Each regional officer develops his/her sector budget but this remains largely theoretical as they rarely receive the funds they need. In fact, the Districts have agreed to cover costs of some regional activities.

One positive TCZCDP intervention is the RCRC which has generated a substantial income since hiring charges were introduced for the meeting room in July 2003. By November 2005, it had generated a total of Tsh 3,229,250. At present, the money is being kept as a reserve to meet running costs when donor financing ends.

9.3.6. Central government agencies

There are several ways in which central government agencies can contribute to coastal management, as illustrated by the following examples:

- Whilst assisting with enforcement activities, the Navy made monthly contributions of 220 litres fuel, and Tsh 540,000 to cover the costs of its personnel
- The Marine Police provided a monthly in kind contribution of at least 240 litres of fuel and 5 litres of engine oil, to assist with enforcement
- DoFi has provided about Tsh 5 million to Tanga Regional Office for some years for enforcement activities, and the TCZCDP has also received funds under the fisheries retention scheme as described above. The new Fisheries Act (Section 29) allows for the establishment of a Fisheries Development Fund ‘to promote and assist development of community management units by giving grants and assisting groups of persons wishing to form fisheries conservation and protection groups’. This could be used to help manage the CMAs. Currently DoFi also has a ‘Miscellaneous Subvention Fund’ that might provide opportunities and is providing funds for tilapia culture elsewhere in Tanzania which could perhaps be expanded.
- Since the end of 2001, MPRU has provided about Tsh two million annually towards fuel costs for patrolling Boza-Sange Management Area, a topping up allowance for the Honorary Ranger, contributions to office costs, and other allowances such as travel. This was a result of the Pangani District Co-ordinator writing to MPRU for funds to support the patrol work that was already underway around Maziwe Marine Reserve within the CMA.

9.3.7. Private sector

At present the private sector makes little if any financial contribution to coastal management. Taxes on tourism and the seafood processing industry accrue mainly to central government. Most deep-sea fishery revenue accrues to DoFi, as well as that from exports of octopus, prawns, and squid. There is a need to raise the argument for a larger share for local Government and to make local Members of Parliament more aware and raise the issue in parliament. The private operators themselves would like to see a greater share of the taxes and fees that they are paying being spent where the fish resources are being developed, to promote sustainability (Jambiya, 2002).

9.4. Conclusion and lessons learnt

Establishing a sound institutional basis and financial sustainability for the TCZCDP were high priorities from the beginning, and good progress was made on both counts, although further work is needed to reach financial sustainability. Efforts were made to try and prevent a ‘project culture’ from developing: project activities were carried out within existing government structures and not in parallel, as failure to do this often jeopardises the sustainability of long-term donor programmes (McShane and Wells, 2004). Occasionally this did occur, with non-statutory bodies and positions being created to fulfil certain functions which then had to be dismantled when main-streaming was undertaken. The earlier (1972-1991) Tanga Integrated Rural Development Programme (TIRDEP) encountered similar problems when its Programme Co-ordinating Unit, which was established parallel with the District structures, ended and staff and activities had to be mainstreamed (Anon 2005). There was also a tendency for committees to proliferate, particularly at village level, which at times led to confusion. For example some villages have “natural resources committees” and others have “environmental committees” (Shauri, 2003a). Overall however, sound structures have been established.

9.4.1. Institutional arrangements

By 2004, both technical and financial District officers understood they needed to plan, administer, implement and monitor future coastal zone work in Tanga Region. The Districts now recognise the strengths of the LGRP, and that they are in charge of their own plans; they also have a much greater awareness of coastal management issues. The challenge is for them to adapt fully the TCZDP processes to current standard District planning systems, such as O&ODP, District Development Plans, and the financial management systems being introduced for local government, such as ERICA. There is already experience in the Districts in doing this with other donor funding programmes (such as Sustainable Tanga, a project under the UN Habitat Sustainable Cities programme). However, there is very variable capacity in the Districts (see Chapter 8), and service delivery is not always good in terms of responding to the needs of the villages.

The process by which the Districts can receive technical input from national agencies also needs clarification. Formal agreements and MoUs are of value, laying out the responsibilities of both parties. Districts need to be willing to enter into such agreements and to recognise shortfalls they have in technical capacity. Equally national institutions that agree to assist must adhere to their obligations. Districts should look not only to government agencies and national institutions but also to national and regional NGOs. Some good examples are already underway, with CORDIO assisting with socio-economic monitoring, SeaSense providing training and technical advice on turtles and dugong, and the coelacanth work being supported by the African Coelacanth Ecosystem Programme (ACEP). NGOs such as WWF and Greencom could be approached for activities such as environmental education and awareness raising.

Institutional arrangements at village level seem to be by and large satisfactory, as are the various co-ordinating mechanisms, notably the TCCF.

9.4.2. Financial sustainability

Many of those involved in the TCZCDP, as well as some of the evaluating teams (e.g. Lewis and Juma, 2005) feel that financial sustainability of Programme activities once Irish Aid funding has ceased is unlikely. Few local revenue generation schemes have been established, local and national government support for coastal zone management is still poor, and impoverished coastal communities are unlikely to implement resource management practices without incentives. A serious concern is that late release of funds from central government to the Districts, and subsequently from the District treasury to field operations, may jeopardise effective implementation. This has already been experienced with funds needed for patrols (see Chapter 5), and such problems have been experienced elsewhere though mechanisms have been found to overcome them (Lewis and Juma 2005).

Substantial donor support for coastal management exists through other programmes such as the World Bank funded Marine and Coastal Environment Management Project (MACEMP) and various regional fisheries projects. There is an urgent need to tap into these programmes. The Programme needs to identify other innovative sources of revenue generation, through an analysis of legislation, review of activities underway in other parts of Tanzania and in other sectors, discussions with TCMP, and experiences from other countries and regions as appropriate. For example, the natural resources sector needs to be brought into the 'sector-wide' approach, whereby a Ministry undertakes to improve all of its sectors/departments under its portfolio, including administration, which gives it access to donor 'basket funds'. Any review should also look at expenditure patterns and mechanisms to determine what changes are

required, whether at community or District level. For example, management costs should be reduced wherever possible. Much of the budget currently goes on allowances for attendance at meetings and workshops; if this could be reduced, without reducing participation of stakeholders, it would have a major impact on the overall funding needed. District staff however require more training on finances, budgets and in proposal writing. The Tropical Biology Association has run training courses in proposal writing for technical officers in Tanzania, and is recommended for these officers.

Sharing of revenue and costs with national agencies, as well as retention schemes for Districts also need further investigation. There are several potential options including:

1. Sharing of revenue and management costs with agencies responsible for MPA management: for example, visitor fees for Maziwe Marine Reserve are collected through an agent who pays them to the DED's Office via the DNRO, who then remits the same amount to the MPRU in Dar es Salaam. The amount collected at present (estimated at about Tsh two million for two years) is insufficient for a revenue sharing scheme, but if more visitors could be attracted to the Reserve, this would increase the revenue (Jambiya, 2002).
2. The Forest and Beekeeping Division has a retention fund, as well as arrangements for revenue sharing with local communities which could be used for the mangrove management plans.
3. According to TCMP's District ICM planning guidelines, if Districts contribute 75% of the costs of preparing a plan, TCMP will contribute the remaining 25% (an estimated US\$15,000) (Torell, 2003). This is not happening and in the pilot Districts such as Pangani, TCMP is contributing around 75% through donor funds and the District is covering personnel costs, buildings and the cost of holding discussion group meetings.

Locally generated revenue will be essential in the future, but this is a problem. On average, a District Council levies 39 different taxes, and administers some 138 different rates but actual revenue collection is minimal. Most local government taxes are evaded, with the average compliance rate for some 23 taxes investigated by the LGRP and DIFD being only 37%. In 1999, the per person annual tax payments made to local authorities averaged \$1.82 or about 4 Tsh per day which does not pay for local services (LGRP and DFID)²⁴. Compliance with levies will only improve if resource use is profitable as well as sustainable. Low compliance is accompanied by weak administration, and collectors who often ignore, manipulate or falsify records, particularly at Ward level. Local tax collection is a priority issue within the LGRP and efforts are being made to reduce the complexity of revenue collection (Jambiya, 2002). The Ministry of Finance policy and regulations on taxation as it applies to coastal fisheries also needs review; for example, at present, fishers are taxed less than farmers even though their input costs are generally lower (Lewis and Juma, 2005).

Tanga has, nevertheless, demonstrated that there is a will to contribute to the management of coastal marine resources, and it seems that the graduated targets for increasing District contributions were of value in encouraging the necessary thinking. There is now a need to pilot the fisheries permit scheme; if successful this would represent another innovative approach to coastal management initiated by the Programme.

²⁴ Reforming Local Government Finances in Tanzania, 2002.

CHAPTER 10: CONCLUSIONS AND LESSONS LEARNT

Sue Wells, Melita Samoily and Solomon Makoloweka

The achievements as well as the less successful aspects of the TCZCDP must be seen in the context of the era in which it was initiated. In the early 1990s, sustainable development and benefit sharing became major elements of biodiversity and conservation programmes. The TCZCDP, initiated in 1994, was one of the first coastal management programmes in the WIO to make livelihoods improvement a central objective, earlier projects having been oriented mainly to MPA establishment. It was also one of the first to start with a community-based approach (Chapter 3). Initiated at a time when the economic outlook was bleak, the TCZCDP took place over a period of considerable economic change in Tanga Region and the country as a whole (Chapter 2). As with many ‘integrated conservation and development projects’ of the time (McShane and Wells 2004), a very broad and ambitious approach was taken, incorporating attempts to trial and implement new livelihood activities, develop and implement fisheries and mangrove management plans, establish and mainstream new institutional arrangements for coastal management, and build capacity through a major training and environmental education programme.

It was soon realised that the number and extent of the objectives of TCZCDP were unrealistic and the rationale of the Programme was changed after four years to focus more on developing a mechanism for sustainable management of the artisanal fisheries, while still retaining the overall original approach. Even so, considerable complexity remained, partly because of the difficulty of making changes once a particular course of action had been started, the unpopularity of halting work on revenue generating activities (Chapter 7) being a case in point.

Furthermore, the Programme covers over 1,600km² and encompasses over 200,000 relatively poor people in 49 communities (Chapter 2) and was thus a vast undertaking given that donor funding averaged the relatively small sum of about US\$ 800,000 a year. Compared with other related programmes in Tanzania, the area involved is at least twice the size of each of Tanzania’s Marine Parks and involves many more people; Mafia Marine Park is 822km², and involves 19,000 people, and Mnazi Bay Marine Park is 650km², with only about 30,000 people.

This chapter provides a general summary of the conclusions and lessons learnt in previous chapters, and shows how the adaptive management approach has been used in the TCZCDP.

10.1. Programme Design

In general, the long-term, phased design, based on the concept of listening, piloting, demonstrating and mainstreaming (Chapter 3), worked well, as did the use of mid-term and final evaluations of each phase which encouraged adaptive management. Changing behaviours and attitudes, and in particular developing collaborative management arrangements, is a slow process. The long term commitment of funds from Irish Aid over 12 years was critical in allowing this phased design and provided the time needed to monitor, analyse and change the Programme’s approach where needed. Such long term funding in the environmental sector is unusual (projects are often funded for only 3-5 years), even though the long lead up time has been demonstrated in other community based tropical marine conservation programmes (e.g. in the Philippines, Alcalá *et al.*, 2005), and it is an often cited lesson (see McShane and Wells, 2004).

10.1.1. Adaptive management

‘Adaptive management’ means that each stage of the management process is assessed to learn what worked and what did not, and the results and lessons learnt are then used in planning for subsequent stages. Salafsky *et al.*, (2002) define adaptive management as ‘the integration of design, management, and monitoring to test assumptions systematically in order to adapt and learn’. The TCZCDP thus put much emphasis on monitoring and evaluation, and undertook both mid-term and final evaluations for each Phase (Chapter 3).

An adaptive management approach in the TCZCDP is well illustrated in: the evolution of institutional arrangements; expansion of management plans from pilot villages to many villages with associated processes for review and assessment; the evolution of enforcement mechanisms (although perhaps not yet complete), from village patrol units, to units that included the Police, to units that comprised villagers, District enforcement officers and the Navy; and the evolution of stakeholder representation across the Region. Adaptation in the light of lessons learnt is clearly demonstrated in the evolution from village management to area management based on resource use, which helped to reduce conflict (Chapter 4). Stakeholder representation improved through the phases: in Phase I, there was a forum for stakeholders and regional workshops, and this finally culminated in the Tanga Coastal Consultative Forum, a regional body that meets twice a year to discuss coastal management issues (Chapter 9).

One of the key changes in the TCZCDP that occurred because of external evaluation was the decision to stop the revenue generating activities in 1998, and to focus on marine resource management only (Chapter 7). However, since the Programme had started on various income generating activities this change was unpopular in the communities. Interestingly, the final evaluation of Phase III recommended that the Programme should re-engage with such activities because of recent greater recognition that the decline in coastal and marine resources will not be halted unless poverty is also addressed. Although the adjustment of the Programme to focus more on fisheries activities after a few years was justifiable in terms of available resources, the subsequent difficulties encountered demonstrate that improving the livelihoods of poor coastal communities ultimately requires that attention is paid to all livelihood strategies in use, a point increasingly being made in discussions on sustainable development (Allison and Ellis 2001, Ireland *et al.*, 2004, Ruitenbeek *et al.*, 2004). This point is strongly endorsed by Tanga’s Regional Secretariat.

10.1.2. Pilot villages

The TCZCDP started with pilot villages, an approach that was widely used in other parts of the world but not in Tanzania at that time. This small-scale approach ensured that those implementing the Programme (particularly IUCN and its Technical Advisers, TAs) listened and learnt first to determine what would work and what would not. Furthermore, if mistakes were made, these would affect fewer people than in the case of a large-scale project. It was a deliberate choice to pick villages that were most keen to do something about their problems, so that other villages could learn later from these villages.

The TCZCDP subsequently adapted the pilot village approach to take account of the Programme’s increasing knowledge of the complex relationships between adjacent villages in terms of their use of fishing grounds, and of the differences between villages. This led to a multi-village process in establishing and implementing collaborative management areas for fisheries and mangroves (Chapter 4). Applying the collaborative approach to management needs careful attention to the individual characteristics of the stakeholder groups, as there are likely to be

many differences that will affect their willingness and ability to participate, as well as the extent to which they will benefit²⁵. A study of community-based fishery management programmes in Zanzibar revealed how superficially similar coastal communities may on closer analysis differ markedly (Levine 2004). Furthermore, significant differences have been found between households within the same village, which affected the success of particular conservation initiatives (Sesabo *et al.*, 2006). It is therefore essential to understand the heterogeneity of coastal communities, and recognise that what might work in one village or household, might not work in another.

10.1.3. Monitoring and evaluation

Successful adaptive management depends on good monitoring and evaluation (M&E). Participatory monitoring was accorded a high priority in the TCZCDP, but like many projects, there were a myriad challenges in developing and implementing a strategy to monitor and evaluate both the impact of the Programme and its progress and performance as a donor-funded project. Changes in TAs and other personnel led to changes in methods (often these were improvements, but nevertheless changes have time, capacity and financial implications), and changes in Programme focus led to disparate datasets and consequent problems with analysis. A number of different approaches were used, ranging from monitoring of only certain components to comprehensive M&E plans covering all aspects of the Programme, all of which had their successes and failures and contributed to learning and experience.

Much of the impact monitoring, such as the health of reefs and mangroves (Chapter 6), is carried out by the stakeholders themselves, including villagers and local government officers, and has been done on a participatory basis (Chapter 6). This contributed to a large extent to the sense of ownership, and has been an example for several other programmes in Eastern Africa (Obura *et al.*, 2002). The presentation of the reef health monitoring results to villagers during the annual review of the CMAs is particularly valuable. The use of these data in management decisions is an importance example of adaptive management, as seen in villagers maintaining the closed reefs long term as they perceived their benefits. The most recent monitoring and assessment plan, the Information Management System (Pabari *et al.*, 2005) is designed to assess the impacts of the coastal management interventions, and is designed to be simple and feasible (Chapter 6). It combines all the datasets (reefs, fisheries, mangroves, patrols, socio-economics) into one database and has established indicators, analysis procedures and graphical reports to encourage assessment and hence adaptive management. The system is already in use in the Districts, although its late introduction during the TCZCDP means that its implementation is not being supported or monitored by any external technical assistance.

The TCZCDP demonstrated the difficulty of maintaining monitoring systems and of measuring the success of management interventions: baseline surveys were not always adequate and monitoring protocols were in places inappropriate. It has also demonstrated the difficulties of gathering the sound scientific data that are needed for successful adaptive management, and the urgency with which these problems need to be addressed. However, these difficulties have provided many opportunities for learning, with many of the lessons now incorporated in the Districts' Information Management System.

²⁵ For example, Kigombe village is surrounded by sisal estates, has access to limited farmland, and so fishing is an important occupation. In contrast, Tongoni is a much larger village comprising six sub villages, three of which are inland with farming as the main occupation, where the TCZCDP agriculture activities such as vermin control resulted in much greater uptake.

10.1.4. Phasing out donor support

The mainstreaming of any donor funded project into local processes and institutions, and its handover to the appropriate stakeholders is invariably difficult, with success dependent on appropriate timing and careful monitoring and review. Several of the evaluations suggested that in the case of the TCZCDP, the external support (donor and technical assistance agency) controlled activities too much, introduced overly cumbersome planning and administration arrangements²⁶, and did not provide sufficient incentives and opportunities for the Districts to move into the key managerial tasks, or to fully empower them to plan and implement their own priorities and deliver services to local communities effectively. The establishment of structures that are not part of the government system, and of positions that are not statutory, can create particular problems, as described in Chapter 9. This is not necessarily the point of view of all TCZCDP partners, but it does seem that the handover occurred without a realistic assessment of the future management needs and technical capacity, and of the magnitude of impact that such a change will have.

An agreed, phased withdrawal, with transfer of responsibility intimately linked to replacement capacity, was the hope of the TCZCDP and its partners. However, the lack of capacity at District level (augmented by the fact that some Regional staff moved to the private sector rather than returning to their Districts during decentralisation) meant that mainstreaming and a more gradual hand over to local government should really have started earlier to provide a longer overlap period while funding and technical support was still available. In hindsight it is clear that the Programme's design in Phase III would have benefited from a less active role of the technical agency, IUCN, on the ground. What would have been preferable would have been a 'hands-off but eyes on' approach. In the event, the pressing need to mainstream in Phase IV meant the rapid withdrawal of external technical assistance before adequate replacement mechanisms and capacity had been established. In 2004 at the start of the exit phase, many District staff still saw the TCZCDP as separate from their daily work, indicating the Programme's operating procedures were not yet fully integrated within local government institutions (Lewis and Juma, 2005). These problems illustrate the importance of committing time and funds to developing a carefully planned exit strategy for large field based conservation programmes.

10.2. Main achievements of the TCZCDP

The TCZCDP has laid a sound basis for future coastal and marine resource management that is potentially applicable elsewhere in Tanzania and more widely in East Africa. The primary achievements are the development of CMA Plans (CMAPs) and collaborative mangrove management plans; the establishment and acceptance by communities of reefs closed to fishing; the mainstreaming of coastal management into local government; the building of capacity at government and community level, including the empowerment of women to take part in coastal management; and the export of Programme ideas and concepts to national Integrated Coastal Management (ICM) policy and approaches.

²⁶ A common problem with donor projects is the introduction of new procedures and approaches, that meet the requirements of donors and technical assistance agencies, but that do not necessarily reflect or complement those in place already and that may be too complex for the capacity available (Porter, 2006).

10.2.1. CMAPs and collaborative mangrove management plans

The main achievement of the TCZCDP has been the development of a collaborative approach to preparing coastal and marine resource management plans that is broadly satisfactory to both communities and the government, with implementation shared by the villages, District staff and regional/national authorities (Chapter 4). There is little doubt that fishers and coastal communities in Tanga Region now have a much greater involvement in, and understanding of, natural resource management and a concomitant greater sense of ownership. A key aspect of this process is the technique of ‘action planning’, where problems, causes and solutions are clearly identified (Torell *et al.*, 2000). The second key aspect of this planning approach is that it is based on resource use, rather than on administrative or political boundaries, and thus more directly addresses the needs of the users.

The TCZCDP team spirit

What I am most proud of is the fact that this Programme has held together for so long, and is still here offering services. Even before we started I had many reservations. I had seen very good projects start and then just end. I've seen the management of projects start with minor intrigues that grow into big problems. I was concerned that might happen with us. But that hasn't happened. And it hasn't been the efforts of one person it has been the whole team holding us together. It started with our meetings every two weeks they brought us together. After Phase I some key people wanted to apply for other positions. I argued that the positive results in Phase I were not good enough, we needed to stay together longer, so we did. Our foundation was good, and the team spirit has motivated us to stay together. District officers working together as a team will continue a cadre has been built, this is how they now do business.

Solomon Makoloweka, Tanga Regional Fisheries Adviser

The CMAPs, although in theory covering a number of issues, are primarily fisheries management plans. This approach to management is recommended in the FAO Code for Responsible Fisheries (FAO 1995), and is reflected in Tanzania's 2003 Fisheries Act which provides for the setting up of ‘management agreements’. Notably, reef closures are included in all the CMAPs established under the TCZCDP, and are being established for increasingly long periods, with most communities seeing them as an acceptable management tool (Chapter 4 and 6). To date, the Districts in Tanga Region are the only coastal areas in Tanzania that have such plans in place although some steps have been taken along the shore of Lake Victoria, and the World Bank/GEF-funded Marine and Coastal Environment Management Programme (MACEMP) and WWF are addressing this in the coastal districts of Mafia, Kilwa and Rufiji.

The success of the CMA approach is demonstrated by the fact that it was extended to mangrove management. The development of collaborative mangrove management areas contributed to what is now a nationwide approach to participatory management of mangrove forests under the national Mangrove Management Plan. Collaborative mangrove management is being adopted as part of other ICM programmes in Tanzania, such as the Kinondoni Integrated Coastal Area Management Plan (KICAMP), north of Dar es Salaam (Akwilapo and Wagner, 2002), and is widespread in south and south-east Asia (Ellison, 2000).

10.2.2. Decentralising and mainstreaming coastal management

Establishing a sound institutional basis for coastal management in the three Districts was a challenge. Good progress was made but further work is needed. The TCZCDP provided support to setting up institutional arrangements at local government level in accordance with

the LGRP, and to establishing Inter-District mechanisms. The TCZCDP is one of the first coastal programme to have looked at cross District issues, and thus is a potential model for the MACEMP/WWF supported activities under the RUMAKI seascape programme in Rufiji, Mafia and Kilwa Districts.

10.2.3. Capacity building

The TCZCDP has undoubtedly led to much greater awareness and understanding of the need for coastal management and what it involves at all levels: individual (children, adults and particularly women), village, District, Region and nationally (Chapter 8). The coastal EE programme, involving both classroom work and field activities, was introduced to 18 primary schools and an estimated 8,000 children were exposed to it over the course of the Programme. This will not only have influenced the children but also adults, through their parents and those who attended the various community events that were organised. The TCZCDP helped to establish over 10 youth clubs with at least a couple of hundred members. Although these were not maintained beyond TCZCDP support, they may have influenced the subsequent behaviour and attitude of these youths, perhaps deterring them from participating in dynamite fishing.

Decentralisation and District capacity

Decentralising the Programme was difficult, but it is Government policy and Irish Aid's experience of other decentralised programmes that working with Local Authorities is the best way. With the TCZCDP we were rather slow in promoting the move from central management to the Local Authorities. Maybe this was because of the way this Programme was initially structured. If we were to start afresh we would work directly with the Districts. There is also the issue of capacity; if you operate from the District level it will be easier to start building capacity at that level.

Dr Sizya Lugeye, Agriculture Adviser, Irish Aid

Over 120 training events were supported by the TCZCDP or attended by TCZCDP stakeholders, and at least 60 local government staff and over 700 villagers were given the opportunity to improve their skills in subjects ranging from business management to beekeeping (Chapter 8). Emphasis was put on 'training of trainers', particularly for the extension workers, and many other people may have indirectly, and later in time, benefitted from the Programme's training interventions.

Perhaps the most successful part of the capacity building component, was the work done to promote gender equality and to increase the role of women in coastal management (Chapter 8). This has led to a more balanced representation of women and men in committees and decision making bodies, and women now often hold key positions. Women are also now much more confident, both in public and in taking on income generating activities to benefit their families.

10.2.4. Support for development of national coastal management policy and legislation

The TCZCDP's work has done much to explore structures for collaborative management within Tanzania's political and institutional framework (Chapter 9). The TCZCDP played a vital role in the development of many national policies and legislation, working in collaboration with national agencies. The recommended process for preparing District level action ICM plans is largely based on that developed for village action planning by the TCZCDP.

From a situation where there was no collective natural resource management system within the communities, the Programme introduced a strong sense of ownership of resources in the face of what was largely open access. This contrasts with situations where artisanal fisheries management programmes have been able to build on established traditional tenure systems as in the Pacific (Anderson *et al.*, 1999, Aswani and Hamilton 2004, Kuemlangan 2004).

Tanga, as a result of the TCZCDP, is the only Region to have adopted the broader approach of managing the fisheries of an entire marine area. However, Shauri (2003a) concluded that the CMAs might not work in other parts of Tanzania without the type of support provided by the TCZCDP to generate the necessary political will and logistical support. However, TCMP, DoFi (in relation to the national Ten Year Fisheries Master Plan), other Districts and neighbouring Kenya, have taken great interest in replicating the TCZCDP approach, and study visits have been made to Tanga to obtain advice. In addition, donors such as the World Bank and USAID are promoting the TCZCDP approach within their own programmes.

Influence on national ICM policy and legislation

TCZCDP has contributed significantly to raising awareness of government officials regarding marine and coastal resources management. Most in Tanga Region are now well versed with the need to protect and conserve coastal and marine resources, consider this a priority issue, and hence integrate it in their development plans. TCZCDP contributed significantly to the development of many policies, strategies, laws and guidelines touching coastal resources. Many by-laws relating to the coastline of Tanga Region originate from TCZCDP efforts. The current Fisheries Policy and Act together with the new Fisheries Regulations have used TCZCDP experience; the development of the National ICM Strategy was possible largely because of TCZCDP contributions and outcomes. The TCZCDP provides a model of a locally based programme not only for Tanzania but also worldwide. Many government officials have been visiting Tanga with a view to replicating this programme to their areas.

Jeremiah Daffa, Manager, Tanzania Coastal Management Partnership

10.3. Impact of the TCZCDP

From the start, the TCZCDP saw monitoring the impact of the Programme as essential for providing the information necessary to adapt management to changing circumstances and so that all stakeholders could see the results of management interventions. Assessing the impact of management interventions requires reference to the goals and objectives of a programme. Those for the TCZCDP are shown in Table 3.2. (Chapter 3) and the goals for each Phase are summarised as follows:

PHASE I: To safeguard the resources of the Tanga Region coastal environment for the benefit of present and future generations of residents

PHASE II: Sustainable use of the resources in Tanga Region's coastal Districts for the benefit of present and future generations of residents

Phases III and IV: Integrity of the Tanga coastal ecosystem improved, and its resources supporting sustainable development

The primary impacts expected would therefore be improvements in ecosystem health and in the livelihoods of the coastal communities dependent on them. Assessing the impact of

programmes such as this is notoriously difficult, particularly where monitoring is not straight forward (see above), but nevertheless conclusions and useful lessons can be drawn.

10.3.1 Ecosystem health

Of the diverse marine and coastal ecosystems found in Tanga Region, coral reefs were the main focus because of their importance for fisheries and because they were already in decline. Initially their health improved, and it is likely that this was linked to the TCZCDP's fishery management interventions through improving enforcement of regulations to reduce dynamite fishing and beach seining, thus reducing damage to reefs, and establishing closed reefs to reduce overall fishing pressure (Chapters 5 and 6).

At first, live coral cover increased on many reefs (Chapter 6), with the highest levels recorded on reefs in the two longest established CMAs, on closed reefs (with some exceptions) and on inner reefs (where fisheries regulations are more easily enforced). As far as reef fish populations are concerned, fish densities for the major groups started to increase around 2000/01 which coincides with when all seven closed reefs had been established. Reef closures appear to have had a positive impact on certain fish groups particularly the commercially exploited species such as the carnivores (groupers, snappers and emperors) and omnivores (grunts/sweetlips and goatfish). As with coral cover, the changes were most marked in the two oldest CMAs, particularly for herbivores (e.g. rabbitfish) and coral health indicator species (butterflyfish and angelfish).

However, both live coral cover and fish abundance have declined in recent years. For coral cover, a change occurred after 2001/2, when there was a decline particularly on closed reefs, and rubble increased. For fish, a dramatic drop in densities, representing a 5-6 fold decline, in all fish groups, was recorded in 2003 and this has largely persisted to 2007 (Chapter 6). The causes of these changes are not well understood and there were also some problems with data reliability. Factors that may have contributed include an outbreak of coral disease and the re-appearance of dynamite fishing. This illustrates the ease with which improvements in reef health can be reversed even if management programmes are in place. The large reduction in herbivores is particularly worrying because they play an important role in keeping down macro-algae. There is therefore a risk of an ecological phase shift on Tanga's reefs, should the low herbivore densities result in macro-algae colonising and out-competing corals.

Although mangroves were not a major component of the TCZCDP, support was provided for the conservation and rehabilitation efforts being led by the national MMP, and this may have contributed to the fact that Tanga Region mangrove cover has shown a recent increase (Chapter 6).

10.3.2. Livelihood improvement

Assessing whether natural resource management interventions have resulted in improvements to livelihoods is fraught with difficulty. Many people in Tanga Region, both in the government and in the villagers, perceive that there has been an improvement in the social and economic well being of coastal communities over the last decade. In several TCZCDP evaluations many fishers have stated that their livelihoods have improved, possibly because they now have a much greater control over the resources they use (Chapters 4 and 5). Determining whether this is due to TCZCDP interventions is not easy, because the lack of socio-economic monitoring means that it has not been possible to look for empirical

evidence of links between management of marine resources and trends in household income. For example, during the external evaluation of Phase III, one community and some government officials said that more children were going to school and had shoes, both of which relate to increased income. In 2004 Lessons Learnt Workshop, participants mentioned changes in the form of new and improved houses, better clothing, and more mobile phones and Television sets. Often the Programme is considered partly responsible, but there could be many causes, as there have been many other changes since the Programme was initiated that affect people's livelihoods. For example, there has been a general improvement in the Tanzanian economy; economic growth has risen from 4% in the 1990s to 6.7% in 2004 (Al-Samarrai and Reilly, 2004), and there were also a number of other donor-funded development projects in the three Districts aimed at livelihood improvement for rural populations (e.g. the large 1972-1991 Tanga Integrated Rural Development Programme (TIRDEP) funded by Germany, Anon, 2004).

The improvement of coastal livelihoods through donor-funded income generating activities is often considered to have had limited success. UNEP (2004), while recognising the need for such activities, states that such projects have tended to be 'ineffective and largely rejected by local communities'. A review by Ireland *et al.*, (2004) for IUCN-EARO (an analysis of case studies from Mozambique, Tanzania, Comoros and Mauritius), also painted a rather negative view. Problems arise where new economic activities are introduced instead of building on existing interests, skills, traditions and activities, and where feasibility studies are not carried out. Unrealistic expectations about the speed with which livelihoods and incomes within a community can improve compound the problem, and even if there is a benefit, fishers may complain that it does not adequately compensate them for lost income from fisheries.

There is often an assumption, or intention, that improving the income of coastal communities will lead to an improvement in the status of natural resources (e.g. a reduction in fishing, or in the use of destructive fishing methods), and that alternative livelihoods will compensate for income lost if open access for fishers is restricted (e.g. through no-take areas). Such links often fail to materialise (Vincent, 2006). Finding alternative employment for fishers is a worldwide problem, not limited to Tanga Region or to developing countries. Fishers in many countries are reluctant to leave their sector. Although economic factors play a large role in this, such as the lack of alternative income generating opportunities, job satisfaction is also a major factor (Pollnac, *et al.*, 2001). For example, given gender differences between farming and fishing in Tanzania, improving agriculture will not necessarily reduce pressure on marine resources, since fishing is primarily done by men and farming by women. There were however indications from the example of Tongoni village, that fishers (in this case beach seiners) were willing to move into agriculture and thus potentially reduce pressures on marine resources. This is an interesting result since there is much debate and scepticism about the merits of alternative livelihood schemes as a conservation and fisheries management approach (see Vincent 2006).

As Ireland *et al.*, (2004) point out, the term alternative income generating activities is a part of the problem. The real need is to encourage adoption of sustainable livelihoods of any kind, not necessarily alternative ones. It is also essential to maintain economic diversification to provide insurance against the collapse of any one livelihood activity or food source. Furthermore, donor support for livelihood activities may have an important indirect impact in building support among communities for associated coastal management activities, and this was certainly the case with the TCZCDP.

The TCZCDP showed that support for livelihood activities needs to go beyond the demonstration stage. Obtaining permits and approval from the government for trials should be made easier. Lack of incentives and security is also still a problem; for example theft was a major problem in both mariculture and agriculture trials undertaken through the TCZCDP. Central government officers often have a poor understanding of business practices and the needs of commercial enterprises, although this is starting to change with Small and Medium Enterprises (SMEs) now being promoted by the government.

Fish catch rates: The evidence that the CMAPs, through closed areas and improved enforcement of fishery regulations, are having a direct positive effect on fish catches and income is weak, although there is some evidence that the TCZCDP interventions may have contributed to stable and recently increasing catch rates in the line fishery (dominated by snappers and emperors, Chapter 5). The lack of clear trends is due to several reasons including poor implementation of management interventions, poor data, and impacts on the marine environment unrelated to fisheries and their management such as coral bleaching and disease. This is discussed in more detail in Chapter 5; the TCZCDP is not alone in finding it difficult to demonstrate increased catches. Nevertheless, some fishers have reported higher catch rates, and their perceptions should not be ignored given their dependence on fishing for their livelihoods (Malleret-King *et al.*, 2006; Meeuwig *et al.*, 2007).

Mariculture: The Programme has demonstrated considerable potential for mariculture in Tanga Region, and identified suitable sites and species that could be used by the Districts (Chapter 7). The Programme also raised awareness among communities and the Districts of the potential for mariculture activities to an estimated 1575 people, including 220 women. Over 20 individuals received training to the level that they could train others and pass on their experience. In addition, the TCZCDP developed a preliminary knowledge base as a result of the trials with tilapia and oysters (Chapter 7).

Seaweed farming: Seaweed production increased dramatically over the course of the TCZCDP but this was due in large measure to the overall growth in the industry nationally and promotion by the private sector. The TCZCDP contributed by helping with zoning and reducing conflict between fishers and seaweed farmers (Chapter 7). Seaweed farming probably does not take pressure off marine resources (see Crawford 2002), as it is carried out predominantly by women, although it may reduce other activities traditionally undertaken by women, such as reef gleaning and collection of firewood, but no data were collected to assess this. In Mozambique, seaweed farming is said to have reduced fishing pressure as well as increased income security (Whittingham *et al.*, 2003). In general, fishers were not interested in seaweed farming because income from it was lower than that generated from fishing, and it involves hard labour. However, if prices improve, more men may become involved and reduce their fishing activities.

Agricultural production: The agriculture component of the TCZCDP was in place for a relatively short period of time, but nevertheless there were some achievements: provision of good baseline information for future work; training of some 300 villagers and District staff, who improved their farming skills; demonstration of successful vermin control methods (principally block farming and hedges) in one village, and of organic farming and vegetable growing through pilot trials (Chapter 7).

10.4. Emerging issues and challenges for the future

Looking to the future

There are still several challenges that lie ahead. The sustainability of Programme activities after donor funding comes to an end is questionable. Full ownership of the Programme activities by local institutions, communities and other stakeholders has yet to be developed. And sustainable funding could be a problem.

G.E. Mhada, Muheza District Council Chairperson

Sustainable continuation of Programme activities after expiry of donor support cannot be assured, and destruction of coastal and marine resources is likely to resurface. The issue of poverty in coastal areas is not adequately addressed; and there is still insufficient commitment in the District Councils and national authorities and a need for them to put more finances into protecting and developing coastal and marine resources. Also, coastal communities still do not get a fair share of revenue generated from coastal resources.

G.P. Msanga, Assistant Administrative Secretary

10.4.1. Ensuring an integrated approach to ICM

The original aim of the TCZCDP was to establish a fully integrated coastal management plan, although this was revised to an issue specific/pilot village approach when the lack of capacity was recognised. However, the need for the full ICM approach remains as the collaborative management plans are still largely sectoral (i.e. for fisheries and mangroves), and Tanzanian national policy is now to produce ICM action plans at District level. When the TCZCDP started in 1994, there was no national policy or legal framework. In 1997, TCMP was established as a programme of the parastatal NEMC, with the aim of guiding implementation of the 1997 National Environment Policy and other related sectoral policies on the coast. These were to promote ICM, improve national coastal planning for the mainland, and coordinate both the overlapping jurisdictions between the various government organisations and efforts at local level (TCMP, 2002). The guiding document is the National Integrated Coastal Environment Management Strategy, which was approved in 2003. Although implementing legislation has not yet been drafted, its recommendations are being acted on. Pangani already has a District ICM Action Plan, but the other Districts need to look at the benefits to be obtained from doing one, and their obligations under the national strategy.

Even where communities are actively involved in management, good legislation is essential to provide the support and authority for enforcement. The Programme has run over a period of time when major changes have taken place in the legislation, aimed at supporting the process of decentralisation, and reflecting the need to respect obligations under the global environmental treaties and conventions that have been adopted. Much of the basic legislation is now in place, but the lack of a clear legal framework for the CMAPs, clear and standardised by-laws, the need for a review of institutional arrangements as a result of boundary changes within the Districts, and for full harmonisation of the Beach Management Unit (BMU) and CMA concepts, must all be addressed. The cross-border initiative with Kenya also needs to be pursued. Links could be made with other national ICM programmes and with regional initiatives, such as the EU-funded Regional Coastal Management Programme for the Indian Ocean (ReCoMaP) to further these activities.

Box 10.1: What is ICM?

A commonly accepted definition of ICM (Hewawasam, 2002) is: a continuous and dynamic process by which decisions are made for the sustainable use, development, and protection of coastal and marine areas and resources. This process aims to overcome the fragmentation inherent in the sectoral management approach and the splits in government jurisdictions at the land-water interface. ICM aims to ensure that decisions in all sectors (fisheries, oil and gas production, water quality, etc) and at all levels of government are harmonised and are consistent with the country's coastal policies. This means that institutional mechanisms must be designed to accomplish this harmonisation in a politically acceptable manner, often requiring the establishment of a committee or other co-ordination body.

10.4.2. Creating a sustainable artisanal fishery

The artisanal fishery continues to be a vitally important sector for the livelihoods of a large percentage of the population of the Districts. The negative effect of poorly managed artisanal fisheries on marine resources and ecosystems has been clearly demonstrated in Tanzania and many parts of the world (McClanahan *et al.*, 1999, Hawkins and Roberts 2004). There are increasing pressures on the Tanga fisheries, including the growing human population and potential new uses of marine resources, such as the export of finfish, the rapid expansion of invertebrate fisheries, and the potential for larger local commercial markets as tourism develops. More attention needs to be paid to post-harvest operations and marketing.

Although the development of the CMAPs has been successful, implementation has proved more difficult, due in part to the large geographical area and the vast number of people involved. Although major efforts were enforcement of fisheries regulations, the results were variable over the course of the Programme. The use of dynamite and beach seines has not been eliminated completely and illegal fishing within the closed reefs still occurs occasionally. More pressure may be needed at Ministerial level to address these illegal activities. Encouragingly, local concerned stakeholders, including the private sector, in Pangani and Tanga formed committees in 2005 to improve surveillance and enforcement against destructive fishing practices. Finally, the worrying declines in fish stocks seen in the Programme's recent monitoring data suggest action to address overfishing is still a high priority.

10.4.3. Strengthening local government

In most countries, local government is on the 'front line' of coastal management, facing huge and constantly changing challenges in trying to meet the present needs of the communities it services, without compromising future sustainability. The TCZCDP has provided an example of how local government authorities can play a key role, in collaboration with local communities. The Districts may therefore take heart from the fact that they are early players in what is likely to become a new movement aimed at bringing recognition to what has been termed the 'missing partner' in coastal management (Box 10.2).

The Districts need much strengthening as evidenced by villagers continuing to say that delivery of services is not sufficient. The role of national, regional and international NGOs in supporting the Districts must also be considered. Strong MoUs and agreements should be developed with national institutions to provide technical assistance, an identified weak point in the TCZCDP. Through their experience in the TCZCDP the Districts are now well positioned to help build a sense of responsibility for coastal management among stakeholders, particularly through stronger engagement with the private sector.

Box 10.2 Local Government Leaders Statement on the management of coral reefs and associated ecosystems, October 2006

The Local Government Leaders Forum held during ITMEMS3 in Cozumel, Mexico, in October 2006 gave an opportunity for local government leaders from six countries (Mexico, Tanzania (Zanzibar), Australia, Philippines, Cook Islands, USA) to share their experiences and to identify priorities for closer and more effective involvement of local government in the management of coral reefs and tropical marine ecosystems. It resulted in the 'Local Government Leaders Statement' which highlights six key steps that should be taken to support and enhance the work of local governments in coastal management:

- Empowerment: support the empowerment and resourcing of local governments to manage tropical marine ecosystems.
- Networks: work with local government and community networks to develop informed partnerships to address the management of tropical marine ecosystems.
- Capacity building: work with local government to develop practical technical capacity at the local level to address marine ecosystem issues.
- Knowledge and communication: communicate current research information in a manner that addresses the needs of local government.
- Political will: work with local government to build the political will to meet the challenges of managing tropical marine ecosystems.
- Recognition of achievement: publicly recognise the achievements of local government in sustainable management of marine resources.

10.4.4. Sustainable financing

Maintaining Programme activities will be a major challenge now that assistance in the form of technical capacity and funding has ended. Larger annual budgets will be necessary now that TCZCDP activities are fully mainstreamed into District natural resource management plans. As described in Chapter 9, a variety of options have been considered for financing coastal management in Tanga, such as improving collection of fisheries levies and ensuring that this revenue is retained for management activities. However, greater political will is required to fully test and implement these options. Further, it is crucial that tangible benefits filter back to the communities themselves, for example through revenue sharing schemes, so that the resource users are able to remain committed and involved in managing their resources.

Using the average annual budget of the TCZCDP (US\$ 800,000 - Chapter 9) and the total area covered by the CMAs (1,600km²), it can be estimated that 1km² of inshore water in Tanga Region has cost about \$500/yr to manage over the last 12 years. TCZCDP staff estimate that about US\$130/km² would now be sufficient to cover key management interventions (Lewis and Juma, 2005). Using the average annual value of Tanga Region's fisheries (US\$ 2.4 million - Chapter 5), 1km² yields fish valued at about US\$1,500. The value of investing \$130/km² in management is thus clear. The value of the reefs and associated ecosystems of Kisite Marine Park and Mpunguti Marine Reserve (c. 40km²) in Kenya immediately to the north of Tanga Region has been estimated at about US\$2 million a year (Emerton and Tessema, 2001); studies from other parts of the world indicate values from just under US\$1000 to several thousand US\$ per km² of reef a year (UNEP-WCMC 2006). Such economic calculations are, however, not widely understood or

accepted by the stakeholders. The TCZCDP would have benefitted from an economic valuation of coastal resources of the three Districts at an early stage, to demonstrate more clearly the rationale for investing sufficient funds in management. Such an exercise would still have great value now, particularly given the shortfall in funding, and was recommended by the January 2004 Lessons Learnt workshop.

10.4.5. Strengthening monitoring and data gathering programmes

There is a pressing need to improve documentation, data collection, document referencing and filing, as this is essential for adaptive management. Activities need to be documented carefully as incorrect information can spread quickly. Further training and technical assistance is strongly recommended in the use of the consolidated data management and analysis system (Pabari *et al.*, 2005) as this was introduced very late in the Programme.

The Village Monitoring Team which does all the reef health surveys, is one of the Programme's greatest assets, and commendably the Districts have made financial commitments to maintain their work. However, for the fisheries monitoring data collection there is less commitment to maintain the Programme's system in view of the existing national fisheries monitoring system. As discussed in Chapter 5 there is an urgent need to harmonise these two systems. It is recommended that partnerships with institutions such as the Institute of Marine Sciences in Zanzibar are strengthened to provide technical support. The Programme could also benefit from linking with global initiatives and use the IOC-UNESCO ICAM Indicators Handbook to monitor progress in coastal management (Belfiore *et al.*, 2006).

The lack of data to demonstrate increased incomes or improved standards of living illustrates the urgent need to establish a socio-economic monitoring programme. Socio-economic monitoring of the coastal communities in Tanga region would have provided a powerful database and tool with which to analyse the social and economic impacts of the TCZCDP. Good surveys were conducted in 1995 and 1997, and it would have been invaluable if these had been repeated at regular intervals. Socio-economic monitoring started in 2004 through the CORDIO/SEMP programme, but still needs further technical assistance, resources, strengthening and expansion. A more detailed analysis of trends in fisher numbers and other characteristics of their life style, particularly those who migrate and those involved in dynamite fishing, is also needed if current destructive practices are to be halted.

10.4.6. Credit-schemes for local communities

Fundamental to making income generating activities work, whether existing ones such as fishing or newly introduced activities, is the need for credit. This was identified as a key issue in several villages at the beginning of the TCZCDP, but was not addressed by the Programme itself. There is widespread demand for savings and credit services in coastal communities, as well as for increased access to larger loans for mid-level entrepreneurs, or groups of people wishing to invest in more expensive activities. There are now several examples of successful village-based savings and credit schemes, facilitated by NGOs, as well as schemes aimed at helping small entrepreneurs save money for investment. Village savings and credit schemes are, however, insufficient for the purchase of major pieces of equipment such as fishing gear or boats as there is a limit to the loan sizes. In order to facilitate access to larger sums, microfinance institutions need to be involved. The low interest rate credit system that has

been established on Mafia Island in Tanzania to enable fishers to buy boats, engines, and gear provides an example of such a scheme, as does a ‘Credit for Small Enterprises for Women and Youth’, run by the District in Mafia. The Tanzania Social Action Fund (TASAF), with the support of MACEMP, is now providing grants for communities to develop income generating activities that will reduce unsustainable fishing practices.

10.4.7. Biodiversity and ecosystem health and climate change

The TCZCDP placed relatively little emphasis on biodiversity conservation per se, but this is beginning to emerge as a priority issue. The initiation of a national programme on dugong and turtle by SeaSense has drawn attention to the importance of Tanga Region for these species. The discovery of the coelacanth, and the extraordinary number of specimens that have now been caught, also make this a priority issue for attention. The CMA structure developed by the TCZCDP provides a framework for future community-based conservation efforts for this species. Under Blueprint 2050, the vision for Tanzania’s future national MPA system, Tanga Region is identified as one of eight priority biodiversity areas (Ruitenbeek *et al.*, 2005). The development of a full system of MPAs within the region, incorporating the existing MPAs of Saadani and Maziwe, as well as the CMAs’ closed reefs, would benefit not only the biodiversity, but also communities and the District economies through fisheries and increased tourism revenue.



The recommendation of the Phase III final evaluation to address the risks from climate change was dropped as it was felt that this issue was beyond the control of the TCZCDP and was being addressed in Tanzania within other sectors. However, coral bleaching, sea level rise and shore erosion are already being felt: reefs in Tanga region have been severely affected by coral bleaching (Chapter 6); and several islands offshore are suffering from erosion and sea level rise, most notably Maziwe Island which has lost all its trees (Fay, 1992). Recent analyses of climate change in the marine environment highlight the importance of setting aside 20-30% in an ecologically representative and effectively managed system of protected areas, combined with sustainable fisheries management, to minimise climate change impacts (Schubert *et al.*, 2006). Building resilience to climate change through carefully designed networks of MPAs which protect biodiversity, is now well recognised as a fundamental management approach in coral reef ecosystems (Obura, 2005). The TCZCDP can take heart that they are several steps along in these approaches through their CMAs and closed reefs. The Districts now need to link with national initiatives and programmes that are conducting sensitivity mapping and vulnerability assessments to address sea level rise, erosion and flooding.



CHAPTER 11: BIBLIOGRAPHY

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