

Chapter 4: Tanzanian Coastal and Marine Resources: Some Examples Illustrating Questions of Sustainable Use

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The coast of Tanzania is characterised by a wide diversity of biotopes and species, typical of the tropical Indo-west Pacific oceans, and the peoples living there utilise a variety of its natural resources. Because of the extent of the diversity and variety, several different examples are used by this study to elucidate the complexity of issues and multiplicity of management responses related to use of coastal and marine resources. It emerges that coastal management requires an integrated cross-sectoral approach to address the wide array of interrelated issues involved.

The study describes the status of selected resources from the principal biotopes (coral reefs, mangroves, sea grass beds and beaches) as well as fish stocks, and it examines various forms of their utilisation. Some special cases of endangered species are also examined. The study attempts to analyse questions of sustainable use in relation to ecosystem dynamics, socio-economic processes, institutions and policies. The characteristics for what we consider as approaching a state of sustainable use are proposed, and the requirements considered necessary for ensuring sustainability are outlined. Past experience and the current status of coastal and marine resource uses are summarised through the examples chosen in order to explain the main constraints to the attainment of sustainability. Crosscutting issues related to the breakdown of traditional management systems for common property resources in the face of increasing commercialisation, privatisation, and external interventions appear to pose general problems. The general experiences of community projects, legislation, and mitigation measures are assessed from the examples we have chosen.

We present an array of general lessons learned and key factors affecting sustainable use of coastal and marine resources. Amongst these we emphasise:

- Dialogue and linkage between traditional and scientific knowledge systems.
- Mechanisms for interaction between scientists, managers and decision-makers.
- Continued human and technical capacity building of research institutions.
- Essentiality of addressing land and sea tenure and common property rights.
- Genuine involvement and empowerment of local communities and civil society including community-based organisations (CBOs), and local non-governmental organisations (NGOs).
- Credible and equitable arrangements for benefit-sharing with communities.
- Open availability of information for overall transparency and accountability.
- Integration of socio-economic opportunities into conservation programmes.
- Recognition of and respect for local and traditional institutions.
- Openness in collaboration between traditional and government institutions.
- Strengthening of relevant institutions providing entry to decision-making.
- Management agreements between institutions for cross-sectoral co-ordination.
- Long-term and broad-based visions in policy thinking.
- Democratic process of public involvement in policy-making and implementation.

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1. Background

Tanzania has a coastline of over 800km stretching from latitude 4°49'S at the border with Kenya to the border with Mozambique at latitude 10°28'S. The continental shelf is narrow with the 200km contour depth about 4km offshore, except at the Zanzibar and Mafia Channels where the shelf extends for up to 80km. The large islands include Zanzibar (two islands of Unguja and Pemba) and Mafia, and there are also many smaller islands, islets and reefs along the coast. The area of the shelf to the 200m depth contour for both mainland Tanzania and Zanzibar combined is about 30,000km². The resources of the shelf area are predominantly utilised by the artisanal fisherfolk.

Tanzania is renowned for the attractiveness of its coastal and marine environments, high marine biodiversity and rich marine and coastal resources. The coastal and marine environments include amongst others: Major estuaries, mangrove forests, coral reefs, sandy beaches, cliffs, seagrass beds and muddy tidal flats. Sandy-muddy flats or rocky reef platforms are found in the intertidal zone, while the sublittoral zone consists of extensive seagrass beds and coral reefs. Rivers including Pangani, Wami, Ruvu, Rufiji, Matandu, Mbemkuru, Lukuledi and Ruvuma all flow to the Indian Ocean and influence the coastal environment through creation of productive brackish water environments in estuaries; maintenance of deltas, tidal flats and shorelines; and nourishment of mangroves and seagrass beds.

These coastal ecosystems interact with each other and together sustain a tremendous diversity of marine life, which is an important source of sustenance for coastal communities. For instance, a wide range of important and valued species are found, including an estimated 150 species of coral in 13 families, 8,000 species of invertebrates, 1,000 species of fish, 5 species of marine turtles, and many seabirds.

There are five administrative regions situated along the mainland coast: Tanga, Coast, Dar es Salaam, Lindi and Mtwara. These regions are further subdivided into districts. The islands of Unguja and Pemba make up Zanzibar, the other part of the Union of Tanzania.

The five coastal regions cover about 15 percent of the country's total land area and are home to approximately 25 percent of the country's population. According to the 1988 census, the estimated population of Tanzania was 23 million and this is projected to have risen to 32 million by the year 2000. Based on a land area of 883,749km², the average population density for the country is 36 persons/km², while for Dar es Salaam region the density is 1,745 persons/km². However, in another coastal region, Lindi, it is only 12 persons/km² (see Table 1).

Economic activity is high in some coastal regions. Over the period of 1980-1994, the five coastal regions contributed about one-third of the national Gross Domestic Product (GDP), with Dar es Salaam leading overall with 20 percent of the GDP. However, Lindi and Coast regions are ranked nationally as the poorest.

Signs of environmental degradation, as well as a decline in natural resources and biodiversity, are beginning to become more obvious. This is evidenced by declining yields of fish, deteriorating conditions of coral reefs, and continuing reduction in the area of mangroves and coastal forests. This degradation is attributed to unsustainable use of coastal resources as well as pressures from the growing coastal population.

There are many development considerations that provide strong justification for improving the management of coastal areas in the region, in particular the dependence of the economies of the country on the functional integrity of the coastal ecosystem.

Various management responses have been (or are being) undertaken at different governance levels in the attempt to manage coastal and marine resources sustainably. These responses include traditional management systems, collaborative management arrangements, and enforcement of policies and laws through regulatory mechanisms. Despite all these efforts, problems of biodiversity loss, pollution, and habitat destruction and degradation continue to increase. This clearly indicates deficiencies in the existing management frameworks.

This paper highlights these deficiencies based on past experiences and the current status of coastal and marine resource uses, and identifies important factors in the attainment of sustainable use of coastal and marine resources. Successful cases of coastal management are also highlighted.

Table 1: Population density of coastal regions.

Region	Area (km ²)	Population density (persons/km ²)			
		1967	1978	1988	2000 (estimate)
Tanga	26,808	29	39	48	62
Coast	32,407	13	16	20	25
Dar es Salaam	1,393	256	605	977	1,745
Lindi	66,046	6	8	10	12
Mtwara	16,707	37	46	53	61
Zanzibar	2,460	149	201	260	353
TANZANIA	881,300	14	20	26	36

Source: Bureau of Statistics, Dar es Salaam

2. Scope of the Paper

This paper emphasises sustainable use in the context of coastal Tanzania from the point of view of the people who use natural resources, and it examines various management regimes and some conflicts of interest between different groups of people in relation to the corresponding natural resources. Social, economic, political, and cultural aspects of sustainability are assessed alongside ecological sustainability.

This approach differs slightly from that of IUCN, which is based upon the definitions suggested by the Convention on Biological Diversity (CBD) and which emphasises “*biological diversity*”, “*ecosystem*”, and “*sustainable use*”, the latter being defined as “*the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations*”. These two approaches should ideally be complementary, not contradictory, but the question as to whether to put biological diversity or people first in the analysis differs.

In relation to the coast of Tanzania, we have identified five principal areas in which coastal peoples make use of natural resources that are valuable to them: Coral reefs, mangrove forests, fish stocks, seagrass beds, and beaches, as well as a sixth category of endangered species for special consideration. Several other natural resource types exist, but we consider these to be of less general significance and do not cover them in this paper.

Since we emphasise the utilisation of natural resources, we do not cover questions related to coastal space occupied by urban settlements, harbour facilities, industrial establishments, oil terminals, *etc.*, except where they directly affect the principal areas defined above.

Threats to sustainability are interpreted as factors and issues that impinge upon the ecological, social, economic, political, and cultural viability of coastal systems. We highlight the roles of traditional management systems that exist parallel to formal legislation, state institutions and other social forces. We also highlight resource use patterns and systems by examining a number of examples from different parts of the Tanzanian coastline – some approaching a status of relative sustainability, others experiencing problems of unsustainability.

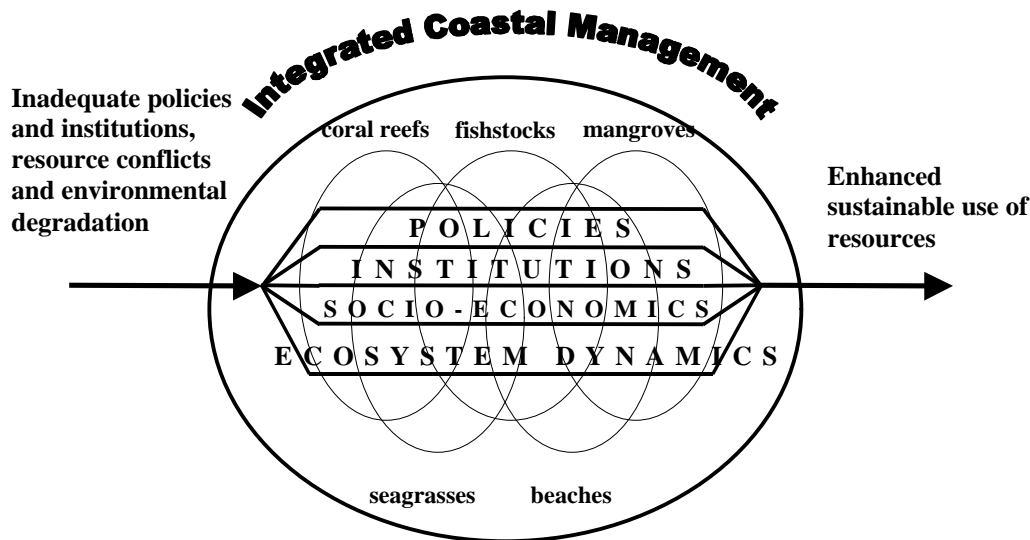
We attempt to describe characteristics that enhance sustainable use of natural resources in coastal Tanzania, as well as requirements and constraints. These are seen in relation to four levels of analysis in the five resource spheres that we have highlighted: Ecosystem dynamics, socio-economic processes, institutional structures, and policies.

Berkes and Folke (1994) explained that maintenance of renewable and non-renewable resources and environmental services at or above the current level is the minimum condition for sustainability.

The questions of sustainable use of the resources discussed in the previous sections are analysed in relation to ecosystem dynamics, socio-economic processes, institutional structures, and policies.

1. Ecosystem dynamics: Biophysical environment characteristics and environmental services; human and environment relationship; carrying capacity (capability and suitability to support utilisation) and natural recovery and rehabilitation.
2. Socio-economic processes followed in the communities in relation to management of resources; traditional knowledge; social incentives for conservation; development of alternative income-generating activities.
3. Institutional structures: Formal and informal organisational arrangements that ultimately shape both societal decision-making and resource utilisation patterns, and distribution of benefits derived from the use.
4. Policy implications of the use regime, the patterns of laws and policies, and tenurial rights. National policy determines the incentive structure for sustainable resource use, the institutional capacity for facilitating environmental management, and economic conditions that influence availability of private and public financial resources to invest in resource management.
5. Integrated coastal management provides a framework and process for linking different sectors and governance levels (see Figure 1).

Figure 1: The elements and processes of integrated coastal management.



3. Description of Coastal Resources

Traditional coastal settlements are generally situated in relation to the availability of natural resources: Correlations can be seen between the location of coastal villages and their proximity to coral reefs, mangrove forests, seagrass beds and fishing grounds. Beaches provide suitable working places and landing sites. More recent developments are also located according to resources: Port facilities occupy natural harbours, tourist hotels are sited adjacent to beaches and coral reefs, and aquaculture sites are situated according to their various biophysical requirements, whereas industrial enterprises are more mobile.

3.1. Coral Reefs

Corals occur along shallow, tropical coastlines where the marine waters are clean, clear and warm. The complex topography and the high retention of nutrients by coral communities make coral reefs one of the most productive ecosystems in the world (Lewis 1991, Hughes 1991; see Figure 2).

Due to the narrowness of the continental shelf of most of Tanzania, coral reefs are typically situated close to land. Coral reefs are common along much of the Tanzanian coastline, and well-developed barrier reefs occur along most of the ocean-facing eastern coastline of the islands. There are also extensive coral reefs and coral outcrops on the leeward side of the islands, and these vary in species diversity. There are about 700 species of reef-associated corals world-wide, and 150 species of scleractian corals have been reported from Tanzanian reefs (Hamilton and Brakel 1984).

The coral reefs provide a range of resources to the adjacent coastal communities and to society as a whole (Bryceson 1981, Richmond 1998). These resources include:

- Food and shelter for animals such as fish, crabs, lobsters, and clams.
- Calcareous sediments that contribute to the substrate and beach formation.
- Natural barriers that protect shoreline against wave action and storms.
- Net sinks for carbon in the form of calcium carbonate.
- Areas for fish breeding and shelter, which support important fisheries. In terms of the total fisheries catch, virtually all of the demersal fish taken are from coral reefs, and a significant part of the other components of the catch are also taken from coral reef areas. The most important fish families among the coral reef catch include the Lethrinidae, Lutjanidae, Siganidae, Scaridae, Labridae, and Mullidae. The other important components of the coral reef catch include octopus, lobsters, squid, various shells for the curio trade, and sea cucumbers (Jiddawi 1998).
- Cultural importance for coastal people.
- Opportunities for education and research.
- Scenic and spectacular sites for tourism, especially for divers and snorkelers.
- Potential for some corals and associated animals to provide products for pharmaceutical and medical purposes.

Coral reefs are currently subject to a wide range of natural and anthropogenic disturbances at different intensities and in varying combinations. The anthropogenic disturbances include direct physical destruction (due to destructive fishing methods and live coral mining), pollution, and over-exploitation (Bryceson 1978). (See Figures 3 and 4). Leading natural disturbances include crown-of-thorns starfish outbreaks and coral bleaching; however, it is unclear as to whether or how anthropogenic influences have affected these phenomena (Johnstone *et al.* 1998).

Over-exploitation of key species (predators and herbivores) is causing a decline in certain species and in conditions for ecological shifts, leading to an abundance of undesirable organisms such as sea urchins and algae (Jiddawi 1999a).



Figure 2: Healthy coral.



Figure 3: Blasting coral with dynamite.



Figure 4: Coral after blasting.

3.2. Mangrove Forests

Mangrove ecosystems play a key ecological role in the coastal environment. Mangroves are trees that flourish in salty, anaerobic and acidic soils. Mangroves grow in sheltered areas of brackish water, where freshwater mixes with seawater. These areas include estuaries, lagoons, bays, tidal creeks, and inlets (Semesi 1986).

The mangrove forests of mainland Tanzania cover about 115,500ha and those in Zanzibar cover 18,000ha (Unguja Island 6,000 and Pemba Island 12,000ha). There are nine species of mangrove trees in Tanzania, though not all are found in every forest (Semesi 1986, Semesi 1991, Shunula 1998).

Mangroves serve many functions: They provide shelter for different species; permanent homes for species such as oysters and crabs; nursery areas especially for fish and prawns (shrimps); breeding grounds for fish; and roosting sites for migratory birds (Macnae 1974, Saenger *et al.* 1983). Mangroves are also important in the protection and stabilisation of shorelines and riverbanks as well as in the enhancement of coastal water quality (Carlton 1974, Wolanski 1985). Additionally, mangroves export nutrients and organic matter to adjacent ecosystems.

Coastal communities in the region have traditionally exploited these rich products of the mangrove ecosystems, as well as various parts of the mangrove trees themselves. For example, mangroves supply communities with wood suitable for house building, firewood, boat building and poles (Semesi 1986).

In recent years, the rate and variety of human influences on the mangroves have increased to the extent that the trees are threatened with destruction in some areas. One of the most pressing issues in the mangrove forests is the loss of sheltered areas due to conversion for commercial purposes. These purposes include conversion to agricultural lands; clearing of mangroves for rice farms in Rufiji Delta, Tanzania (Semesi 1991); conversion to salt pans (Semesi 1991); conversion to aquaculture ponds (prawn farming) (Semesi 1998); and clearance for urban and industrial development (Semesi 1991). Other threats include alteration of the hydrological conditions (dams upstream of rivers) (Semesi 1986); pollution through using mangrove forests as rubbish dumps (Shunula 1998); and over-exploitation of resources, mainly through clearing of mangroves for fuel and construction purposes (Banyikwa and Semesi 1986).

3.3. Fish Stocks

Marine fisheries in the coastal Tanzania area are predominantly subsistence and artisanal and are mainly concentrated in shallow waters (less than 30m). Subsistence and artisanal fisheries catches are mainly comprised of a few species groups, namely parrot fish, rabbitfish, sardines, and mackerels, which together account for over 50% of the total catch. The biodiversity of catches are very high by global standards.

The subsistence and artisanal fisheries use traditional as well as modern boats and gear (see figure 5). The vessels include *ngalawa* (outrigger dug-out boat), *mtumbwi* (dug-out canoe), *dau* and *mashua* (planked boats). The gear includes *dema* (basket fish-trap), *uzio* (stakes tidal fish-trap), *mshipi* (hand-line), *nyavu* or *jarife* (gill-net), and *juya* (seine net) (Bryceson 1985).

Fishing plays an important role as a source of protein-rich food and employment. The number of full-time fisherfolk operating in Zanzibar is about 2,300 (Lyimo *et al.* 1997) and there are about 15,000 fisherfolk along the coast of Tanzania (Haule and Kiwia 1999). The per capita consumption of fish is 25-30kg/person. The contribution of fishery to the GDP varies between 2.1-5% in mainland Tanzania and 2.2-10% in Zanzibar, mostly from export of fishery products (Jiddawi and Ngoile 1999). Tanzania exports marine fishery products are valued at US\$7,652,700 from the mainland and US\$598,203 from Zanzibar (Jiddawi and Ngoile 1999). These products include prawn, *bêche-de-mer*, shells, lobster, crabs, squids, octopus, sardines and aquarium fish.

The fishery industry also supports a significant number of individuals working in associated sectors such as boat building and repair, gear repair, and marketing of fishery products.

There are also several industrial fishing companies in operation; all of these are foreign-owned (some in joint ventures with Tanzanians) and mostly operate in the Bagamoyo-Saadani area and the Rufiji Delta, fishing mainly for prawns (shrimp) (Mgaya *et al.* 1999). They also catch many non-target species and dump these as low value 'by-catch'. The trawlers severely damage seagrasses and other bottom biotopes, thus harming the habitats of the fish and crustaceans. This has a negative impact on the artisanal and small-scale fisheries too, in addition to the direct physical damage caused by trawlers to traps and nets belonging to traditional fishers.

Various segments of the inshore fishery sector have recently been showing signs of overexploitation. This can be seen especially in Zanzibar where the trend in annual catch is showing a decline. The total annual catch in Zanzibar was about 20,000 tonnes in the 1980s, but currently it has dropped to less than 13,000 tonnes per annum. This reduction in fish catch can also be observed in some localised areas such as Chwaka Bay (Jiddawi 1999b). The small pelagic fisheries of Zanzibar have also witnessed a drastic decline from 600 tonnes caught in 1986 by the Zanzibar Fisheries Corporation vessels to 91 tonnes caught in 1997 (Jiddawi 1999a).

For the long line fisheries in most parts of the eastern African region including Tanzania, the catch rate, in numbers and weight, has declined (Ardill 1984). Tuna fleets from Europe fish intensively off the coasts of eastern Africa to the benefit of their commercial interests.

Shark fin trade has also declined and some species are rarely seen now in Tanzania waters (Barnett 1997, Jiddawi and Shehe 1999).

The demand for fishery resources has been gradually increasing with the growth in population and tourism development. This has caused an increase in fishing pressure and the use of gear that is efficient but destructive. Some of the destructive gear commonly used includes dynamite, beach seine, sticks, spears, and *juya la kigumi* (dragged net used when smashing reefs). The latter fishery practice is one of the most difficult to control because the net used is not illegal; however, it is the action involved in the technique of using the net that is a problem as it involves smashing corals with sticks to chase out hiding fish. The use of poison in fishing has also been observed.

Destruction of habitats by humans, particularly through indiscriminate mangrove cutting, also has a negative influence on fisheries resources.



Figure 5: Fishing using traditional methods and equipment.

3.4. Seagrass Beds

Seagrass beds are a common feature in subtidal and intertidal mud and sand flats, coastal lagoons, and sandy areas around the bases of shallow fringing and patch reefs. In Tanzania, seagrass beds are widely distributed from high intertidal to shallow subtidal areas. They are found in sheltered areas of the coast around Kilwa, Rufiji, Ruvu and Moa. They also occur extensively on the western side of Pemba, Unguja and Mafia islands. Seagrasses are common in the vicinity of coral reefs, and are linked to them physically and in terms of energy flows.

Seagrass beds are highly productive and serve many ecological functions. These include providing breeding, nursery, and feeding areas for many invertebrate and vertebrate species including commercially important species of finfish and shellfish; and shelter and refuge for resident and transient adult animals. Seagrasses are an important food source for herbivorous invertebrates, fish, dugong, and green turtles.

Additional ecological functions of seagrass include the trapping of sediments, which reduces sedimentation over coral reefs and therefore protects shorelines, and the dissipation of wave energy, which also provides protection to the beaches.

Because seagrass beds are mainly found in shallow water close to shore and to human activities, they are very vulnerable to pressure from those activities. Major threats to the survival of seagrass beds come from excessive sedimentation of coastal waters resulting from the different human activities; from increased turbidity, which tends to cut down the light penetration; and from inshore prawn trawling and seine nets, which destroy seagrass beds.

3.5. Beaches

Beaches are an interface or meeting zone between land and sea. They are dynamic features and are often under the combined influence of many factors and processes which themselves are subject to change. These include geological, climatic and oceanographic processes.

Beaches are important both ecologically and economically. For example, sandy beaches are essential as nesting habitats for marine turtles. Turtles are dependent on availability of beaches for successful reproduction: Female turtles lay their eggs on sandy beaches some distance above the spring high tide mark; once turtle nesting beaches are established, the females often return to the same beaches to lay eggs. Beaches also offer recreational areas for local people and tourists alike. Muddy beaches support a variety of benthic fauna that are fed upon by a diversity of resident and migratory birds. Moreover, beaches offer working places for coastal communities, relaxing and attractive environments, and a source of income through tourism. Additional functions of beaches include acting as a buffer against wave action and serving as nesting sites for birds.

Beaches are affected by a number of human activities, some of which lead to beach erosion problems, inaccessibility for local people if the beaches have been privatised, and disruption of the nesting areas. Sand removal/obstruction, degradation of protective ecosystems, and construction on the beaches are the main threats to beaches.

3.6. Endangered Species

Dugongs (*Dugong dugon*) have not been sighted for many years in Tanzanian coastal waters and may no longer be present at all (they still occur in Mozambique). The decline and extinction of dugongs appears to have occurred with the introduction of industrial trawling in Tanzania.

The loggerhead turtle (*Caretta caretta*) is considered vulnerable while the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), and leatherback turtle (*Demochelys coriacea*) are all considered endangered by Frazier (1976) and Thiagarajan (1991).

Some of the turtle nesting sites include the beaches between Jambiani and Makunduchi in Unguja Island, on Mnemba Island, and on a small islet at Mwanamwana north of Tumbatu Island, Mafia, Latham and Misali Islands. Other sites are Kipumbwi, Kilwa Kisiwani and Pangani along the Tanzania mainland coast (Frazier 1976, ZESS 1993a,b, Khatib 1998).

Turtles are illegally exploited for their meat and eggs and, in the case of the hawksbill, for the carapace, which is used for ornamental purposes. It is the epidermal plate material of this species that is inaccurately termed 'tortoise shell'. Trawler vessels and fisherfolk using gill nets also catch turtles incidentally.

Turtle populations have probably declined in recent years due to loss of the nesting sites. Maziwi Island, for instance, was an important breeding site for the green, hawksbill and olive ridley turtles. The small island submerged below the high spring tides in the early 1980s and is no longer suitable for nesting (Fay 1992). The development of hotels along beaches is also another reason for the declination of nesting sites (*e.g.*, on the east coast of Unguja Island there are now 22 hotels compared to none in 1988).

Although turtles are officially protected in Tanzania, there is little effective enforcement and their status continues to be threatened through hunting, egg collection, nesting disturbance, and incidental capture in nets. In Zanzibar, marine turtles are protected by the 1993 fisheries regulations under the 1988 Fisheries Legislation. Although these regulations prohibit the capture of sea turtles, the law does not prohibit possession of turtle products or meat. Recently, the transport of turtle meat from rural to urban areas in Zanzibar has been prohibited. This has somewhat curtailed the sale of turtle meat in urban areas.

4. Management Responses

Different management responses have been (or are being) undertaken in management of coastal and marine resources in Tanzania. These responses include traditional management systems, enforcement of policies and laws through regulatory mechanisms, and collaborative management arrangements.

4.1. Traditional Management Systems

It is now becoming acknowledged by authorities and scientists that fisherfolk in Tanzania (and in other parts of the world) know much more about the coastal and marine environment than previously realised. Surprisingly, it has taken a long time for marine scientists and decision-makers to realize the value of this knowledge and more importantly to begin seriously recognising it, although this was advocated long ago (Bryceson *et al.* 1982).

There has even been a misconception that fisherfolk do not plan their activities. Fishing activities are dependent on seasons, weather conditions and lunar/tidal effects. All these factors make fishing a very risky undertaking. To spread the risk of fishing, a sharing system based on labour and capital inputs as well as on age and experience is widely used in coastal communities (Mesaki and Maghimbi 1995). This system brings a sense of ownership and responsibility to the different groups benefiting from the sharing.

Table 2 highlights examples of traditional knowledge and management systems. These examples clearly indicate that all three levels of traditional knowledge, *i.e.*, knowledge, management systems, and institutions, are in existence. Berkes *et al.* (1995) identified three levels of traditional knowledge: (i) local traditional knowledge of resources and environment; (ii) traditional management systems based on existing knowledge and imposed restrictions on resource utilisation; and (iii) social organisation for co-ordination, rule-making and enforcement.

Traditional management systems impose both direct and indirect restrictions upon individuals for the benefit of a larger group. As 'rules of thumb', four types of restrictions are provided (Gadgil and Berkes 1991):

1. Total protection of some ecosystems. Chwaka Bay mangroves in Zanzibar have been managed for many years through traditional and government-coordinated management systems. Michamvi villagers claim exclusive rights over mangrove forest use and they have used the mangroves for subsistence only. However, this is being undermined by the fact that the government authorities are issuing permits for commercial exploitation of resources.
2. Total protection of selected important species. According to Williams and Basha (1997), villagers of Ukongoroni in Chwaka Bay have a traditional closed season for octopus during the months of June to August.
3. Protection of critical life history stages. In Chwaka Bay, prawn fishing used to be prohibited for two to three months at the time when prawns were hatching (Tobisson *et al.* 1998).
4. Organisation of resource harvests under supervision of local experts or leadership.

Traditional management systems and many customs and traditions associated with fishing in Tanzania have broken down because of pressures from commercialisation, population growth, technological innovations and deterioration of the authority of elders as guardians of management systems (Tobisson *et al.* 1998). While in several places colonialism is regarded as one of the main contributing factors to the collapse of traditional management systems, in Tanzania that was less directly the case. During the German and British rules and even after independence, fishing was not considered a priority activity by the authorities, and therefore there were fewer interventions by the Governments than, for instance, in cash-crop agriculture.

Traditional management systems in other parts of the world have evolved over time and adapted themselves to the new challenges and opportunities. Village communities of the Solomon Islands, for example, have developed a fee-paying system for tourists and industrial pole-and-line tuna boats, in line with their common property regulations (Baines 1989). The traditional management systems in Tanzania, however, have basically retained their mode of operation, which is based mainly on trust and respect for the authority of elders. With emerging external challenges, pressures, and opportunities, traditional management systems have become more vulnerable and increasingly fail to survive.

Lack of legal recognition for the traditional systems of management in recent years has led to their decline. It is only the latest policies and legislation that do acknowledge the importance of reviving traditional management systems. However, the mechanisms of their institutionalisation have not yet been specified.

The involvement of local communities and integration of their traditional knowledge into planning and implementation processes of resource management regimes are the foundation of any successful management regime. This is due to the fact that such a management system is based on sound knowledge (traditional and scientific) and is acceptable to resource users, as their needs have been incorporated.

4.2. Policies and Legislation

There are several sectoral policies and legislation that have relevance for the management of marine and coastal resources in Tanzania. Various uses of these resources are regulated by specific laws on fisheries, marine parks, agriculture, forestry, industries and trade, land use planning, environment, mining, energy, and tourism. Table 3 summarises the main policies, legislation and plans that are relevant to the management and protection of coral reefs, mangrove forests, fish stocks, seagrass beds, beaches, and endangered species.

Table 2: Examples of traditional knowledge and management systems.

Area	Description
Lunar/tidal effects on fishing activities at Chwaka, Matemwe and Mkokotoni (Tobisson <i>et al.</i> 1998, Mesaki and Maghimbi 1995) .	Fisherfolk of Chwaka, Matemwe and Mkokotoni have a wealth of knowledge on lunar/tidal effects and their relationships to the availability of fish. The fisherfolk apply this knowledge to make optimal use of the resources.
Uroa/Pongwe octopus-fishing discord (Bryceson 1994).	During 1992, the fisherfolk of Pongwe village in eastern Zanzibar over-exploited the octopus resources on the stretch of coral reef off their village. They had to ask permission from the neighbouring village of Uroa to be allowed to collect octopi from their reef during 1993. But the Pongwe villagers were only allowed to do so on the conditions that (i) they should pay a token fine to Uroa villagers, (ii) they would not harvest octopi from their own reef for that year, and (iii) they were teased by Uroa fishers and forbidden to answer back throughout this period. This seemed to function as an effective resource management system between two neighbouring villages, with social sanctions being applied to one community in return for its use of the other community's resources for a defined period of time. However, it might be imagined that such a system would not be so effective in relation to a commercial company that is owned by a foreign or urban-based businessman and that is exploiting octopi on nearby reefs.
The use of fence traps (Tobisson <i>et al.</i> 1998, Mesaki and Maghimbi 1995).	Fence traps are fishing gear used in many areas including Chwaka Bay to trap fish when the tide is moving out. Traps are owned by individuals or families, who have exclusive rights to harvest fish from them.
Chwaka/Marumbi fishing gear conflict.	There has been a recent unfortunate conflict between two villages in eastern Zanzibar, Chwaka and Marumbi, over use of particular types of fishing gear. Lives have been lost and the situation is complicated by the fact that the Chwaka people are considered sympathetic to the main opposition political party whilst Marumbi are supportive of the ruling party. The police have intervened in favour of Marumbi fisherfolk, who mainly use basket traps and hand-lines to fish, whereas Chwaka fisherfolk are increasingly using small-meshed seine-nets. It is argued by Marumbi sympathisers that the Chwaka nets are probably leading to depletion of fish stocks, but scientific studies of fish catches have not yet been undertaken. Recent attempts to arbitrate in this conflict have fortunately led to a reduction of tensions.
Crab management system in Chwaka Bay (Tobisson <i>et al.</i> 1998).	The number of crabs found in the mangroves has decreased significantly due to increased demand and technological changes. Crab fishing used to be confined to low water during spring tides, when it was possible to collect the crabs in the mangroves; however, with the increased availability of diving-masks and snorkels, the picking of crabs could be done at any time.
Prawn management system in the mangroves of Mapopwe Creek, Chwaka Bay (Tobisson <i>et al.</i> 1998).	The system that existed up to about 30 years ago was maintained jointly by the inhabitants of Chwaka and Charawe villages. The system involved closing the fishing areas for a period of two to three months when the prawns were hatching. The system collapsed following the deterioration of the authority of Chwaka elders as guardians of resources, and the non-recognition of their authority by government authorities.

Table 3: Some of the main policies, legislation and plans relevant to management of coastal and marine environments.

Resource	Policy	Legislation	Plans
Coral reefs.	<ul style="list-style-type: none"> National Fisheries Sector Policy and Strategy Statement, 1997. 	<ul style="list-style-type: none"> Fisheries Act, 1970. Marine Parks and Reserves Act, 1994. 	
Mangrove forests.	<ul style="list-style-type: none"> National Forest Policy. 	<ul style="list-style-type: none"> Forest Ordinance. 	<ul style="list-style-type: none"> National Forest Action Plan 1990/91–2007/08. Management Plan for the Mangrove Ecosystem in Tanzania, 1991.
Fish stocks.	<ul style="list-style-type: none"> National Fisheries Sector Policy and Strategy Statement, 1997. 	<ul style="list-style-type: none"> Fisheries Act, 1970. Marine Parks and Reserves Act, 1994. Deep Sea Fishing Authority Act, 1997. Territorial Sea and Exclusive Economic Zone Act, 1989. 	
Seagrass beds.	<ul style="list-style-type: none"> National Fisheries Sector Policy and Strategy Statement, 1997. 	<ul style="list-style-type: none"> Fisheries Act, 1970. Marine Parks and Reserves Act, 1994. 	
Beaches.	<ul style="list-style-type: none"> National Land Policy, 1995. 	<ul style="list-style-type: none"> Town and Country Planning Ordinance, 1956 Cap 378. 	<ul style="list-style-type: none"> Town/City Plans.
		<ul style="list-style-type: none"> The Town and Country (Public Beaches Planning Area) Order, 1991. 	
Endangered species.	<ul style="list-style-type: none"> National Fisheries Sector Policy and Strategy Statement, 1997. 	<ul style="list-style-type: none"> Fisheries Act, 1970 Marine Parks and Reserves Act, 1994. 	
Cross-cutting.	<ul style="list-style-type: none"> National Environmental Policy 		
	<ul style="list-style-type: none"> Water Policy, 1991. 	<ul style="list-style-type: none"> Water Utilisation (Control and Regulation) (Amendment No. 10), 1980. 	
	<ul style="list-style-type: none"> National Land Policy, 1995. 	<ul style="list-style-type: none"> Land Act, 1998 Village Land Act, 1998. 	
	<ul style="list-style-type: none"> Local Government Reforms. 	<ul style="list-style-type: none"> Local Government (District and Urban Authorities) Acts, 1982. Regional Administration Act, 1997. District and Village bylaws. 	
	<ul style="list-style-type: none"> Public Health. 	<ul style="list-style-type: none"> Public Health (Sewerage and Drainage) Ordinance. 	
	<ul style="list-style-type: none"> Mining Policy. 	<ul style="list-style-type: none"> Mining (Environmental Management and Protection) Regulation, 1999. 	

Evaluation of some of the policies, legislation, regulations, plans, and strategies shows clearly areas of conflict among different sectors or implementing institutions, as well as areas of weakness. The following examples highlight those areas of conflict/weakness (Makaramba and Kweka 1999):

4.2.1. Powers of Local Authorities

- Local Government Reform Policy states that local government councils are autonomous in policy-making, operational decision-making, and bylaws-making, while the central government retains ownership of all natural resources, and powers of policy formulation and bylaws-making under sectoral natural resources legislation.
- Revised Local Government Acts authorise central government to regulate and monitor local councils.
- Revised Local Government Laws do not provide for establishment of environmental committees as stipulated in the National Environmental Policy.

4.2.2. Fisheries

- Although the Fisheries Act specifies that the Director of Fisheries may impose conditions on the closing period for fishing and may also determine the methods used in fishing, the number of fisherfolk to be engaged, and the number of fishing vessels to be employed in a particular fishing site, no regulations have been issued to that effect.
- Certain types of restricted nets are still being manufactured locally or imported.

4.2.3. Conflicting Authorities

Conflicting or non-functioning government management systems and overlapping jurisdictions are serious policy problems. In practice, when legislation is enacted, the responsible ministry is required to develop its own strategy for implementing the legislation through development of regulations and management mechanisms. This is done sector-by-sector and without consultation between sectors. This process requires resources and expertise. Lack of infrastructure, personnel, and funding has resulted in the non-translation of the laws into regulations and management strategies or into enforcement, which is generally very weak. Unilateral translations of the laws have in some cases developed into conflicts. Some examples are cited below:

- Salt making licences are issued by the Commission of Minerals and land titles by the Commission of Lands.
- Local authorities continue to issue licences for cutting mangrove poles and for construction of salt pans despite the government ban on cutting imposed in 1987. The ban was lifted in 1992 and the Mangrove Project now controls cutting.
- Whereas the Forestry Division has regulations that designate all mangrove forests as reserves, the Fisheries Division issues permits for the development of prawn farms and the Ministry of Industries and Trade issues permits for the extraction of salt in the same designated mangrove forest reserve areas.
- Mining laws allow for the granting of mining rights in protected areas, without consultation with the Minister responsible for land matters and/or protected areas.

4.2.4. Cross-cutting

- Most of the legislation consists of controls and prohibitions, or 'don'ts', while in reality the government does not have adequate enforcement resources. The government fails to encourage and promote voluntary compliance.
- There has been minimum translation of the national legislation dealing with coastal and marine environments to district and local levels.
- Unavailability of resources, insufficient political support, pressure on government from interest groups, and lack of transparency have contributed to weak enforcement of the legislation.

- Some important aspects such as environmental impact assessments, emission standards, industrial waste standards, and good practice guidelines are not covered by the existing regulations.
- Enforcement mechanisms, where appropriate, are weak and inefficient. Enforcement bodies have inadequate personnel, facilities, and finances to enforce the laws.
- Fisherfolk, women practising algae farming, and whole local communities have regarded the beach and the tidal-flat areas as common public spaces. They have been claiming exclusive rights to these areas. However, they are in conflict with the tourism industry, which wants to lay exclusive claim to these areas also.

Despite the policies, legislation, and plans designed to manage and protect coastal and marine environments, loss of species and damage to coastal and marine environments continue to occur (see Table 4).

Table 4: Ownership/benefit sharing and participatory processes as reflected in the policies/legislation.

Policy/legislation	Description
National Land Policy, 1995.	<ul style="list-style-type: none"> • Dual land tenure system. • All land owned by State. • Stipulates that all beaches are public.
Land Act, 1998.	<ul style="list-style-type: none"> • Statutory right of occupancy stipulates the right to use and occupy land through Title Deed.
Village Land Act, 1998.	<ul style="list-style-type: none"> • Customary right of occupancy gives the right to use and occupy land through Certificate of Customary Land issued by village councils and registered at District Land Registry.
National Fisheries Sector Policy, 1997.	<ul style="list-style-type: none"> • Allocation and utilisation of fisheries resources in favour of rural communities. • Involvement of fisher communities in planning, developing and managing fisheries resources.
National Forest Policy, 1998.	<ul style="list-style-type: none"> • Community-based. • Village creation and ownership of forests. • Joint management agreement between central government and local communities and equitable benefit sharing.
National Environmental Policy.	<ul style="list-style-type: none"> • Local authorities responsible for overseeing planning process and establishing local environmental policies and regulations.

4.3. Collaborative Management (or Co-management)

Collaborative management (or co-management) involves the sharing of the functions, rights, and responsibilities of resource management among various stakeholders (Pomeroy and Williams 1994, Borrini-Feyerabend 1996). The primary stakeholders in co-management normally include government authorities and resource users.

The Government of Tanzania has recently started involving local communities in a meaningful way in the development of policies, legislation and regulations as well as in the management of coastal and marine resources. This reflects the acknowledgement of the limitations of the current management regimes by the government authorities responsible for management of coastal and marine resources. In other words, it is a reflection of the fact that policies and legislation based on controlling and fining by the government authorities are only one component of resource management. The other equally important component is the involvement of communities in all aspects of resource management.

Furthermore, most initiatives, with funding from development agencies and international organisations established to address management problems/challenges of coastal and marine resources, have also adopted co-management practices in their interventions.

In our analysis of co-management practices in Tanzania, most of the information has come from two protected areas, the Mafia Island Marine Park (MIMP) and Menai Bay Conservation Area (MBCA), and a pilot Integrated Coastal Management Programme, Tanga Coastal Zone Conservation and Development Programme (TCZCDP).

4.3.1. Successes of the Co-management Practices

Through these initiatives, significant achievements have been made in reducing the impacts of a number of environmental threats. These initiatives have succeeded in the following ways:

- The practice of dynamite fishing (Mafia, Menai and Tanga) and the use of beach seines, or *juya* (Mafia), have to a large extent been stopped in those areas. For some fisherfolk, *juya* is the only means available to them for fishing. Efforts are currently underway to find an alternative fishing gear to replace *juya* (van Ingen and Makoloweka 1998, Ngaga *et al.* 1999, Kelleher 1999).
- There has been a reduction in the mining of live corals in Mafia. For small islands such as Juani, Chole, Jibondo and Bwejuu, lime from live corals is the building material available. The park is experimenting with land-based fossil corals and clay bricks as alternative building materials.
- There has been a reduction in the exploitation of high-valued stocks such as octopus, sea cucumber and lobsters. This has been possible through a permit system based on available scientific information. The minimum allowable take of octopus is 10cm mantle length. The number of fisherfolk extracting octopus is limited to 350 only and octopus processing plants to two only. MIMP has also banned the collection of sea cucumber by scuba diving.
- In addition to the participatory processes, the Tanga Programme has also made significant achievements in fisheries conservation and management, promoting the role of women and improving environmental awareness (van Ingen and Makoloweka 1998, Kelleher 1999).

The assessment of Tanzania's co-management experience with respect to coastal and marine resources has demonstrated the following:

- In co-management systems, the degree of power sharing and the amount of responsibility between the government authorities/programme (or project) management team and local communities range from full control by the former to shared control by the authorities in charge and local communities. In all the co-management practices reviewed, the government remains legally responsible for the overall management of resources, while the resource users' needs are included in the planning and implementation processes.
- Different mechanisms have been used to actively involve various stakeholders in decision-making processes. MBCA has established district environmental committees that draw members from villages and other stakeholders. These committees provide a link between the Project and the communities as well as with the government agencies. At the village level, Village Conservation Committees have been established. These committees have been instrumental in surveillance and law enforcement systems, educating villagers on environmental conservation and monitoring project activities. In addition, there is a Steering Committee composed of representatives from the World Wide Fund for Nature Conservation (WWF), the Commission of Natural Resources, the Department of Environment, the Ministry for Regional Administration and Special Departments, local committees, and district commissioners. Tanga Programme is guided by a Regional Steering Committee with the following membership: Regional Administrative Secretary, District Executive Directors of Muheza and Pangani, Tanga Municipal Director, and representatives of Irish Aid and IUCN's East Africa Regional Office (EARO). This Committee approves annual work plans, reports and budgets, and makes policy decisions.
- Participatory processes have been widely used in the designing, planning and implementation of different programmes. These processes involve both primary and secondary stakeholders in socio-economic and resource assessments, issue identification and analysis, and evaluation and monitoring (Tanga Coastal Zone Conservation and Development Programme); in development of a General Management Plan (Mafia Island Marine Park); and in demarcation of boundaries (Menai Bay Conservation Area) (van Ingen and Makoloweka 1998, Ngaga *et al.* 1999, Kelleher 1999).

- As highlighted in the previous section, supportive policies and legislation for co-management practices currently exist in Tanzania. However, making co-management approaches work effectively on the ground will require a change in the attitudes of government authorities as well as local communities:
 - Despite the approval of the Local Government Reforms, which give more powers to the district authorities, there is still too much dependence on directives and guidance from central government.
 - The Tanga Programme has not succeeded in establishing bottom-up planning. The Programme planning cycle (village action planning → district planning → programme planning) is not followed, as district work plans are based on the Programme work plan instead of on the village action plans (Kelleher 1999).
 - Local communities are not satisfied with the kind of support they receive from district staff. The district staff have been having difficulties responding to villagers' concerns punctually, providing convincing explanations for their own actions, and solving the villagers' problems (Kelleher 1999).
- Formal management agreements are used to define roles and responsibilities of collaborating partners as well as improve relations among institutions. These agreements have been developed through participatory and transparent processes. In Tanga, village-based collaborative fisheries management regimes cover about 70% of the entire coast (Kelleher 1999).
- Local communities are involved in enforcement of regulations and village bylaws. In Tanga and Menai Bay, the local communities are currently participating in regular patrols (Kelleher 1999, Ngaga *et al.* 1999). More importantly, part of the costs of patrols is borne by the district authorities. Tanga and Muheza districts are paying for the fuel of Mwambani and Kigombe patrol units, respectively.
- MBCA has developed regulations and procedures governing fishing and the establishment of fishing camps, or 'dago'. Through these regulations, the local community in the area excludes outsiders from fishing in the Bay. For instance, the fisherfolk from Dar es Salaam are prohibited from fishing in the Bay (Ngaga *et al.* 1999). This creates a sense of ownership and responsibility in the local communities in the Bay.
- There are indications that some communities have started receiving economic benefits that the communities attribute to these management initiatives. Between January 1998 and June 1999, the fish catch at Bweleo and Unguja Ukuu in the Menai Bay increased by 35% and 8%, respectively (Ngaga *et al.* 1999).

4.3.2. Challenges/Weaknesses

- External forces, particularly international agencies and donors, have significant influence in initiating and promoting co-management practices. None of the co-management projects in this study was initiated by the government authorities or resource users themselves. The set-up of these structures is reason for concern in terms of the sustainability of these co-management initiatives:
 - The setting up of independent structures to support planning and implementation of programmes. Tanga and Menai have set up structures to implement their activities. These structures do not have a permanent institutional base and their future after these programmes end is uncertain. In MIMP there is a permanent management structure set up by the government that co-ordinates all activities supported by different organisations.
 - Allocation of resources. Significant resources are allocated to set up these structures and service them, instead of being delivered to the local level where the problems are.
 - The basis of the project/programme-initiated participation processes. These processes are not based on recognition and understanding of the ways in which existing communities or organisations are organised and operate. For instance, the Tanga Programme has spent significant resources training district staff in a number of aspects that are currently not part of their portfolio of activities. More resources should have been allocated to the institutional strengthening that could guarantee long-term sustainability (Kelleher 1999).
- In defining the role of government institutions in co-management arrangements, both the government and local communities have important roles to play. The challenge is to find the most effective roles for each.

There is an ongoing process of revising resource management policies and laws and creating the legislative framework for devolving resource management responsibilities to the resource users.

The efforts highlighted above have to a large extent resulted in small, well-managed islands over a relatively short period of time. However, large areas of coastline are not covered by any form of management regime. In the long run, this will create more pressure on the managed areas. To address these problems, some of the programmes are planning to have large buffer zones around their core areas of operation.

The proportions of the budget allocated to the IUCN Foreign Technical Advisor, their management fee, operations and various costs in comparison with the small amount allocated for community grants and local personnel are shown in Figure 6.

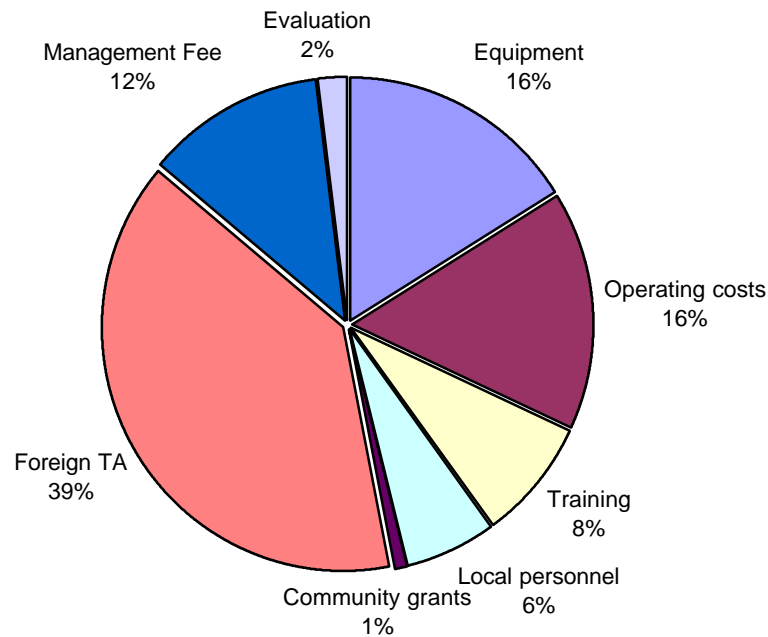


Figure 6: Budget expenditure for the Tanga Programme. Note the amount of funds allocated for community grants and local personnel compared to the amount for the Foreign Technical Adviser (TA) and IUCN Management Fee and Operations.

4.4. National Integrated Coastal Management

Integrated Coastal Management (ICM) is defined as “...a continuous and dynamic process that unites government and the community, sciences and management and sectoral and public interest in preparing and implementing an integrated plan for the protection and development of coastal ecosystems and resources” (GESAMP 1991).

In recognition of the need to tackle the challenges/problems highlighted in the previous sections as well as to seize opportunities for economic growth that addresses local needs, the Government of Tanzania, with

assistance from the United States Agency for International Development (USAID), started in 1998 the process of developing a national policy for integrated coastal management. During this process, it was demonstrated that different sectors can work together, and central government can work with local government and resource users to identify and develop solutions to the problems existing in the coastal zone. The whole process is very participatory, with the involved individuals and institutions providing most of the information and data. It has been and continues to be a good learning experience, particularly for the experts from government institutions, which normally do not apply participatory methodologies. Through working group meetings, close working relationships have developed between experts from government institutions, scientists, and representatives from non-governmental organisations (NGOs) and the private sector. The policy is in the White Paper stage and has been submitted to the Cabinet for its endorsement before being forwarded to the Parliament for approval.

It is envisaged that the policy, when in place and properly implemented, will:

- Improve the decision-making process by providing clarification and guidance on resource use and allocation at both national and local levels.
- Provide a framework and process for linking different sectors and harmonising their decisions and policies about coastal resources management.
- Provide mechanisms for achieving intersectoral planning and management of resources and people.
- Support decentralisation by providing a structure that is appropriate and workable to local resources management.
- Provide a framework for building both human and institutional capacity for interdisciplinary and intersectoral management of coastal resources (TCMP 2000).

5. Lessons Learned

Emerging from the examples we have examined and from our overview of the status of resource use in coastal Tanzania, we attempt to draw the following lessons:

5.1. Ecosystem Dynamics

- Both traditional and scientific knowledge systems of coastal ecology and ecosystem management exist, but there are many gaps and there is a need for much improved dialogue and mutual respect between these knowledge systems.
- Further strengthening of human and technical capacity is required for improved understanding and monitoring of coastal ecosystem processes.
- Securing of land/sea tenure and common property rights enhances efforts to ensure utilisation of resources within ecologically viable limits.
- Conducting ecologically relevant research that addresses management questions is necessary.
- Linking coastal management programmes with research institutions is beneficial.

5.2. Socio-economic Processes

- Involvement and empowerment of local communities and civil society in coastal management prioritisation, decisions, and activities is necessary.
- Information regarding proposals and plans for possible coastal interventions should be made openly available.
- Community-based projects with genuine participation have a high rate of success.
- Conflicts of interest can be resolved or avoided by fair processes respecting coastal communities' systems of land/sea tenure and common property rights.
- Benefit sharing has mainly been practised through provision of social amenities and development of alternative economic activities.

Table 5: Major factors affecting the sustainable use of coastal resources in Tanzania.

COASTAL RESOURCES	VALUES / USES		ISSUES THREATENING SUSTAINABILITY	MANAGEMENT RESPONSES	EXAMPLES IN COASTAL TANZANIA
	ECOLOGICAL	ECONOMICAL			
Coral reefs	<ul style="list-style-type: none"> Habitat shelter. Food chain support. Wave barrier. Sand production. Carbon sink. 	<ul style="list-style-type: none"> Fishing. Tourism and recreation. Pharmaceutical products. Coral mining. 	<ul style="list-style-type: none"> Physical damage. Over-exploitation. Pollution. Coral bleaching. 	<ul style="list-style-type: none"> Traditional systems. Legislation. Protected areas. Community projects. 	<ul style="list-style-type: none"> Mafia, Tanga, Kojani, Uroa/Pongwe.
Mangrove forests	<ul style="list-style-type: none"> Habitat shelter. Food chain support. Wave barrier. Detrital breakdown. Sediment/pollutant trap/filter. 	<ul style="list-style-type: none"> Fishing. Timber, firewood. Eco-tourism. Additional products. Aquaculture sites. 	<ul style="list-style-type: none"> Over-exploitation. Clearing. Pollution. 	<ul style="list-style-type: none"> Traditional systems. Legislation. Protected areas. Community projects. 	<ul style="list-style-type: none"> Rufiji, Menai, Bagamoyo, Mtwara.
Fish stocks	<ul style="list-style-type: none"> Food chain support. 	<ul style="list-style-type: none"> Fishing. 	<ul style="list-style-type: none"> Over-exploitation. Conflicts between subsistence, artisanal and industrial trawlers. Inappropriate fishing methods. Habitat destruction. By-catch. Pollution. 	<ul style="list-style-type: none"> Traditional systems. Legislation. Community projects. 	<ul style="list-style-type: none"> Mkokotoni, Matemwe, Lindi, Mtwara, Chwaka/Marumbi.
Seagrass beds	<ul style="list-style-type: none"> Habitat shelter. Food chain support. Detrital breakdown. Sediment/pollutant trap/filter. 	<ul style="list-style-type: none"> Fishing. 	<ul style="list-style-type: none"> Inappropriate fishing methods. Pollution. 	<ul style="list-style-type: none"> Traditional systems. Legislation. 	<ul style="list-style-type: none"> Bagamoyo.
Beaches	<ul style="list-style-type: none"> Wave energy absorption. Habitat shelter. Turtle nesting sites. Sediment/pollutant trap/filter. 	<ul style="list-style-type: none"> Working place, landing site. Building sites. Sand mining. Tourism and recreation. 	<ul style="list-style-type: none"> Accessibility. Erosion. Cultural conflicts. Pollution. Inappropriate erosion mitigation measures. 	<ul style="list-style-type: none"> Traditional tenure and access systems. Legislation. Mitigation measures. 	<ul style="list-style-type: none"> Kunduchi
Endangered species (e.g., turtles, dolphins, dugong, red colobus monkeys, holothuria)	<ul style="list-style-type: none"> Biodiversity values. 	<ul style="list-style-type: none"> Eco-tourism. 	<ul style="list-style-type: none"> Over-exploitation. Accidental catches. Habitat disturbance and destruction. 	<ul style="list-style-type: none"> Legislation. Protected areas. 	<ul style="list-style-type: none"> Nungwi, Kizimkazi, Jozani.

- Transparency is essential to establishing and maintaining a credible system of benefit sharing.
- In the absence of strong and dynamic civil organisations, a small group of scientists managed to provide leadership in promotion of integrated coastal management nationally and regionally.
- Civil society should be encouraged to critically debate and address coastal issues, to support local communities and government efforts, and to oppose issues with which it does not agree.

5.3. Institutions

- Local and traditional institutions have existed along the Tanzanian coast for centuries, changing and adapting with time in response to various internal and external influences. Some of them have been particularly eroded by more recent colonial and post-independence processes, while others have remained quite robust.
- There is a need to recognise and strengthen local and traditional institutions that effectively manage coastal resource use and reflect local communities' interests.
- Formal institutions addressing coastal issues require long-term and broad-based vision and cross-sectoral co-ordination relevant to priority needs of the people.
- Instances of conflicting or overlapping mandates should be addressed.
- Formal institutions need support to build their capacity in relevant fields of competence in order to fulfil their roles adequately.
- Care should be taken to avoid erecting new parallel institutions dependent upon external inputs that may marginalise existing institutions.
- Traditional and government institutions should cooperate towards integrated coastal management efforts on a basis of openness and mutual respect.
- Transparency and accountability are essential for institutional credibility.
- Involvement of local NGOs in coastal management is only emerging now. Fisherfolk in Mtwara and Lindi have established an NGO called 'Shirikisho' to campaign for and actively protect coastal and marine environments.

5.4. Policies

- Until recently, policies and laws on resource management have emphasised exploitation efficiency rather than sustainability in resource use.
- Policies and laws should recognise and respect traditional land and sea tenure.
- Policy-makers need to adopt long-term thinking that addresses broad-based issues across sectors in an integrated manner.
- Policy making processes should be participatory, transparent and accountable in order to assure relevance, acceptance and credibility.
- In addition to environmental impact assessments, public hearings should be used as a means of collecting views on plans or proposals for major coastal interventions.
- Solutions to environmental problems do not lie with creation and/or revision of policies and laws, but with a combination of management regimes, particularly a collaborative management approach.
- Outside policy interventions, and conditions put forward by financial institutions or donors, should be transparent and subject to public scrutiny and debate.

6. Key Factors Affecting Sustainability

The review of the examples and the lessons learnt from them have clearly shown that there are some basic principles that need to be encouraged and promoted to ensure sustainable use of coastal and marine resources. These include maintaining and enhancing resources for local use; identifying and supporting new opportunities

to supplement village incomes; reducing pressure on the resource base; and developing mechanisms that encourage local stewardship and management of the resources.

6.1. Ecosystem Dynamics

- Dialogue and linkage between traditional and scientific knowledge systems integrated into coastal management.
- Establishment of mechanisms for interaction between scientists, decision-makers and managers.
- Continued human and technical capacity building in research institutions.

6.2. Socio-economic Processes

- Involvement and empowerment of local communities and civil society.
- Recognition and respect for traditional land and sea tenure.
- Open availability of information.
- Equitable benefit sharing with communities involved.
- Integration of socio-economic opportunities into planning and implementation of conservation projects and programmes.
- Community contribution to meeting some of the costs of implementation of planned activities.

6.3. Institutions

- Recognition of traditional institutions, or alternatively, institution-building based on relevant components of the traditional management regimes.
- Collaboration between traditional and government institutions based upon openness and mutual respect.
- Strengthening of the existing relevant institutions that provide entry to decision-making processes;
- Development of management agreements between institutions to improve cross-sectoral co-ordination.
- Creation of opportunities to build trust between government officials and NGOs (*e.g.*, short-term staff exchanges could help build trust and develop a long-term partnership).

6.4. Policies

- Long-term and broad-based thinking.
- Science should inform the policy process, through clarifying the options for and the implications of different policies.
- Public involvement in policy-making and implementation.
- Policies should be based on a wider range of regulatory and non-regulatory tools, with regulation and enforcement increasingly used as a last resort.

Table 6: Information requirements, constraints and indicators for sustainable use of coastal resources in Tanzania.

	CHARACTERISTICS ENHANCING SUSTAINABLE USE	REQUIREMENTS FOR ENSURING SUSTAINABILITY	CONSTRAINTS TO ATTAINMENT OF SUSTAINABILITY
ECOSYSTEM DYNAMICS	<ul style="list-style-type: none"> Utilisation of the resources does not exceed rates of regeneration. 	Knowledge of: <ul style="list-style-type: none"> Resource status and dynamics. Rates of utilisation. Rates of regeneration. 	<ul style="list-style-type: none"> Lack of appreciation of traditional knowledge. Inadequate technical and human capacity. Conflicts of interest. Lack of alternative livelihoods. Infringements of land/sea tenure and common property rights.
	<ul style="list-style-type: none"> The integrity of the ecosystem is not damaged by utilisation or pollution. 	Knowledge of: <ul style="list-style-type: none"> Ecosystem status. Ecological and physical impacts of utilisation or pollution. Potential rate of recovery. 	
SOCIO-ECONOMIC PROCESSES	<ul style="list-style-type: none"> Improved quality of life and equitable distribution of benefits. Gender equity. Empowered decision-making. Active civil society (CBOs, NGOs). 	<ul style="list-style-type: none"> Participation and empowerment in decision-making. Respect for cultural values and traditional knowledge. Monitoring of benefit distribution. 	<ul style="list-style-type: none"> Income generation possibilities limited. Conflicts of interest. Land/sea tenure undermined. Engrained cultural gender-bias.
INSTITUTIONS	<ul style="list-style-type: none"> Incorporation into existing structures. Transparency and accountability. Fair representation. Human resources developed. 	<ul style="list-style-type: none"> Long-term institutional vision based upon priority need. Genuine and active involvement. Capacity to respond to changing circumstances. 	<ul style="list-style-type: none"> Conflicting or overlapping mandate. Inadequate legal and institutional framework. Reluctance to share responsibility. Lack of trust and credibility.
POLICIES	<p>Traditional management:</p> <ul style="list-style-type: none"> Regime remaining robust. Continued recognition by people and Government. <p>Local authorities:</p> <ul style="list-style-type: none"> Adequate powers to develop and enforce bylaws. Mechanisms to accommodate traditional management and national policies. <p>Government management:</p> <ul style="list-style-type: none"> Co-ordination between sectors and institutions. Consistence and relevance between sectors and different levels of authority. National economic policies not in conflict with resource management. 	<ul style="list-style-type: none"> Long-term and broad-based thinking behind policy-making. Relevance to the needs of the people and governance levels. Adequate resources for enforcement. 	<ul style="list-style-type: none"> Lack of capacity and leadership within relevant sectors to amend policy. Conflicts of interest between sectors and governance levels. Lack of involvement of people in policy development. Lack of human and technical resources for enforcement. Lack of transparency and accountability. Political and donor interference and conditionality <i>Ad hoc</i> choice of priorities.

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