Tana River Delta

Conservation and Development Management Plan

Draft for discussion

(Matiku draft version of 5 Nov 09)

Chapter 1

Introduction

Location and status

02°30'S, 40°20'E, Coast Province, Tana River and Lamu Districts 130,000 ha: Altitude 0–37 m: Status: Unprotected: Global recognition: Important Bird Area: Categories: Globally-threatened species, East African Coast biome species, congregations; Key Biodiversity Area (KBA) and Global Biodiversity Hotspot

Site description

The Tana Delta is the name loosely given to the floodplain ecosystem of the lower Tana River, a vast wetland complex on the Kenyan coast. The delta is roughly triangular in shape, with its apex at Lake Bilisa (north of Garsen) and its base a 50 km stretch of beach along Ungwana (or Formosa) Bay, stretching from Kipini in the north-east to Mto Kilifi in the south-west. This low-lying area is bounded by higher land to the east and west, and to the south by a dune system bordering the Indian Ocean. It forms the interface between the river and the ocean, with fresh and brackish lakes and streams, freshwater and saline grasslands and wetlands, and successional stages of forest and woodland on the riverbanks and the dune ridges parallel to the shore (Robertson & Luke 1993).

The mouth of the river has shifted many times. Today, the main stream of the Tana follows an artificial course. More than a century ago, the flooded river cut through into a canal dug for navigation from Belazoni, on the main river, into the Ozi (itself possibly an old Tana course). As a result, the river now flows directly into an estuary at Kipini, rather than into the complex system of channels and distributaries leading to its old mouth at Mto Tana. Until recently, some fresh water still flowed into the 'old' delta through one of these channels, the Kalota Brook. However, since 1988 this has been blocked by a small dam built by Pokomo farmers, who use the tidal bore to push fresh water into their fields and irrigate their crops.

The entire floodplain in the lower parts is covered by alluvial sediments, transported and deposited during the annual flooding of the river. These lie over quaternary sediments that include marine sands, mud and coral breccia. Moving inland, the rainfall drops from around 1,000 mm per year at Kipini to less than 600 mm at Garsen. Flooding happens not as a result of local precipitation, but because of rain in the river's catchment on Mt Kenya and the Aberdare Mountains. Normally, the

major floods occur in April–May, with a smaller, short-rains flooding in October–November. The timing, extent and duration of the flooding vary greatly from year to year.

Vegetation types

The Tana River Delta contains a very wide variety of habitats, including riverine forest, grassland, woodland, bushland, lakes, mangroves, dunes, beaches, estuaries and coastal waters. Small fragments of riverine forest, not nearly as extensive as the forests north of Garsen, occur along the present or former river courses. *Diospyros* and *Sorindeia madagascariensis* dominate the main canopy, with *Cola clavata* and *Garcinia livingstonei* beneath (Ecosystems Ltd. 1985). *Phoenix reclinata* and *Barringtonia racemosa* are also prominent (Survey of Kenya 1984). Some 67,000 ha of the delta are covered by floodplain grasslands, subject to seasonal flooding (Njuguna 1992). The extensive areas with heavy clay soils are covered by grasslands dominated by *Echinocloa haploclada*, along with *E. staginina*, *Sporobolus helvolus*, *Panicum maximum* and *Cynodon dactylon* (Survey of Kenya 1984). In areas that remain seasonally flooded for long periods, the sedge *Cyperus rotundus* dominates, with *Ecinochloa colonum*. Grasslands of *Digitaria alscendens* and *Sporobolus confunis* occur in more elevated, sandy areas, such as the levees along old river courses. Inland of the coastal sand dunes and mangroves, saline grasslands are dominated by the spiky *Sporobolus spicatus* and the salt-bush *Suaeda monoica*.

West of the floodplain is bushland, with a diverse composition including species of *Boscia*, *Combretum* and *Commiphora*. Wooded bushland or grassland, with fire-resistant Doum Palms *Hyphaene coriacea*, *Terminalia spinosa* and *Thespesia danis*, occupies a broad swathe east of the floodplain, merging (through an intermediate woodland that includes *Diospyros cornii* and *Croton dichogamus*) into the Boni Forest vegetation to the north.

Other bushland associations form a complex mosaic with the floodplain grasslands. Areas of bushed grassland on slightly raised ground are dominated by *Acacia zanzibarica* with the grass *Sporobolus helvolus*. Denser patches of wooded bushland thicket include the shrubs *Dobera glabra*, *Grewia* sp. and *Commiphora schimperi*, with *Panicum* sp., *Leptothrium senegalense* and *Cenchrus ciliaria* among the grasses. Parallel to the coast along Ungwana Bay run lines of high dunes, some as much as 37 m above the sea. These are covered by their own distinctive vegetation, a dense thicket dominated by *Dombeya* sp. and *Grewia similis*. In the valleys the thicket mingles with taller trees, such as the palms *Hyphaene coriacea* and *H. compressa, Garcinia livingstonei, Euphorbia candelabrum* and *Afzelia quanzensis.*

Palms are prominent in many places, with Borassus *Borassus aethiopum* and the Wild Date Palm *Phoenix reclinata* as well as Doum Palm *Hyphaene coriacea*. In places, especially those cleared and burned in the past, these form substantial tracts of palm-bushed grassland (Ecosystems Ltd. 1985). Tall mangrove forest, with all of Kenya's eight mangrove species represented, grows at Kipini in the Tana estuary and along the network of channels further south.

As well as seasonal wetlands in the oxbows and floodplain depressions, the delta contains a number of more-or-less permanent lakes and marshes. These include Lakes Bilisa, Dida Warede, Harakisa, Kongolola, Kitumbuini, Moa and Shakababo. Some of these may dry out in certain years (O. Nasirwa, *in litt.*), but others, like Lake Shakababo and Bilisa, maintain true aquatic plants (including Nile Cabbage *Pistia stratiotes* and Water Lily *Nymphaea* sp.) and good populations of several species of fish (Ecosystems Ltd. 1985, Njuguna 1992).

Luo and Luhya immigrants to the area are responsible for an active and thriving fishery, while Orma pastoralists use these wetlands as dry-season grazing areas for their livestock. Fishermen also camp for days or weeks, while catching, salting and drying fish, on the coral outcrops of Mwamba Ziwayuu, some 10 km offshore from Kipini. About 10 ha of coral is exposed here at low tide, shrinking to a set of nine small coral platforms when the tide is high.

The other main ethnic group in the area, the Pokomo, are agriculturalists who cultivate a narrow strip on either side of the river, and around the seasonal and permanent wetlands. As the floods start to recede, rice is planted in the shallow water. Several crops of rice follow the water as its level drops, and other crops, such as maize and sweet potatoes, are planted on the drying mud (Ng'weno 1993). As well as small-scale cultivation, there is an irrigation scheme growing rice in traditional style at Ozi, near Kipini, and a much larger, mechanised one upstream, east of Garsen, that is eventually intended to cover as much as 16,000 ha.

Tana Delta Resources

Human resources

The Tana River Delta is an area with a modest population. The area is characterized by a migratory population consisting of livestock herders who migrate to the lower plains during the drought months of January and February. The young people have also left the area to look for employment in urban areas of Mombasa, Malindi and Nairobi and this has reduced the number of

youth in the area. Despite all this the population has grown and only decreases during drought and floods. The population in Garsen Division where most of the project falls has a population of about 52,000 people with an estimated population density of around 4 persons per $km^{2.}$ The low population density favours pastoralism requiring expansive landscape. The estimated total permanent population at the delta is 25,000 people of which 44% are Pokomos, 44% Ormas, 8% Wardei while other Ethnic groups account for the remaining 4%. The Wardei are a smaller group originating from Ethiopia who are also pastoralists. The Pokomo are mainly subsistence farmers who farm along the River Tana.

Tana River District Profile

Division	No. of locations	No. of sub-locations	Area(km 2)	2006 projected population	Population density
Bangale	4	8	6,125	18,246	3
Madogo	4	8	1,836	26,695	15
Bura	4	9	4,834	35,438	7
Galole	11	22	9,100	42,932	5
Wenje	5	11	557	15,584	28
Garsen	7	16	11,412	45,369	4
Tarasaa	4	10	838	22,610	27
Kipini	4	8	715	15,354	21
Tsavo NP	-	-	3049	-	-
Total	43	92	384,466	222,228	5

Source: Kenya National Bureau of Statistics, Tana River District, 2006

Economic activities

The main economic activities in the Tana Delta area are mainly centred on livestock keeping and herding for the pastoralists and crop production for the agriculturalists. There are also other cases of agro-pastoralism and the rest a small minority are in employment either locally or outside the area. A summary of the main economic activities is shown in the table below.

The Economic Activities of the Communities in Tana Delta

Occupation	**Percent (%)**
Herdsman (pastoralists)	38.9
Keeping livestock	8.3
Business man/woman	1.7
Farming and livestock	8.9

Farming	35.6
Employed	6.7
Total	**100.0**

Source: Socio-economic Survey Data, for Sugarcane EIA

Livestock resources:

The Tana Delta is currently performing important ecological functions. The site is an important dry season grazing area for the pastoral communities coming as far as from Somalia exemplifying the strategic importance of the pastureland not only to the local communities but the entire region.

The dry season grazing area falls within the Tana River flood plains, which are seasonally nourished by rich silt deposits and nutrients deposited through flooding. Therefore, the dry season grazing area is rich in pasture capable of supporting large numbers of livestock for a long period. The dry season grazing areas is an important part of sustainable grazing cycle as it relieves pressures on the wet season grazing areas, which would otherwise be depleted of pasture during the dry season and subjected to serious environmental degradation. Reliance on wet season grazing area to feed livestock during both wet and dry season will spell doom to the pastoralism and may lead to serious environmental degradation through depletion of biomass and soil erosion and that is why this grazing cycle is equal to the sustainability of the livelihoods in the Tana Delta. Livestock keeping is the main source of livelihood of the pastoral communities although sedentary communities also keep livestock to supplement other livelihood sources such as farming, fishing and bee keeping. The pastoralists keep the following types of livestock: cattle, sheep, goats, camel and donkeys. About 20,000 heads of cattle permanently graze at the core of the Delta, but during the dry season the figure rises to 60,000. The livestock value is estimated at Kshs 1.2 billion assuming a price tag of Ksh 20,000 but when the seasonal influx of cattle into Tana River Delta reaches 200,000 heads at the height of the dry season, the value goes as high as Ksh 3.0 billion assuming a market price of ksh 15,000 during the dry season. The pasture is valued at Kshs 100 million. Notably, without the dry season grazing reserve the total loss to Kenya could easily be seen as the Ksh 3.0 billion in only one season and the cumulative suffering and national spending to sustain people would make the costs even higher over years.

A summary of the livestock types and numbers of livestock in the Tana River district is provided in the table below:

Types and number of livestock in Tana River District (TRD) and Garsen Division

Type	Number		% TRD livestock in Garsen Division
	TRD	Garsen Division	
Cattle	335,000	60,000	17.9
Sheep	260,000	52,000	20.0
Goats	360,450	45,000	12.5
Camels	57,950	400	0.7
Donkeys	19,580	3,600	18.4
Local chickens	105,000	58,000	55.2
Ducks	4, 50	Few	-

Source: Ministry of Livestock and Fisheries Development Annual Report, 2005 (in EIA study Report, 2007).

Agriculture:

Agriculture is also an important socio-economic activity within the Tana River Basin. Crops most commonly grown in the basin include: mangoes, rice, maize, cassava, bananas, greengrams, beans, peas, melons, cowpeas, pawpaw, tomatoes, kales, onions, cabbages, sugarcane, and vegetables. These crops are produced for both household consumption and sale. The region is well known for the production of the popular apple mango and rice from Bura irrigation scheme. The estimated value of agricultural production ranges between Kshs. 80-160 million.

Fisheries Resources

The FISHBASE website has listed 44 fish species, while a study conducted in 2002 by Luc De vos et al. recorded at least 30 species in the lower Tana River, most of which were found in the main river channels, particularly in sheltered, low velocity areas, swamps and in the oxbow lakes, which provide unique spawning grounds for fish species. These fisheries resources (especially lung fish) provide ecological functions not only to the coastal market but also to fish eating communities in Nairobi, Western and Nyanza provinces. Fishing along the river has attracted not only the local communities but traditionally fishing communities from other parts of the country who are engaged in small scale fishing for the

purposes of domestic consumption as well as for sale. Fishing is an important source of food, income and employment. The Fisheries are valued at Kshs. 0.6 billion.

Water Resources

Tana River is the longest river in Kenya covering over 1000km^2 long with a catchment area of between 95,000 km^2 -120,000 km^2 traversing the landscape from its source in Aberdare Ranges in central Kenya to the Indian Ocean. The seven folks hydro electric power stations and Bura irrigation scheme is located in the upper parts of the Tana Delta. It is an important source of water for livestock, irrigation, domestic, industrial and recreation functions. The importance of the river for livestock is not restricted to the delta area itself but the whole of Tana basin. Adequate supply of good quality water is crucial for a vibrant livestock sector. Already there are both small and large - scale irrigation (Bura) schemes along the Tana River. Also, communities along Tana River use the water for domestic purposes. These include rural and urban settlements. In addition, the river is an important source of recreation such as boat riding and sport fishing. The river water supports industrial functions such as power generation, tourism, and micro-enterprises found within the basin. A critical use of the water is the invaluable maintenance and sustenance of ecological goods and services hosting critical habitats, unique birds and biodiversity. Therefore, Tana River water supply is an important means of livelihood support to the whole of Tana River basin. The input value of water is estimated at Ksh 600 million given the current water charges imposed by the government.

Forestry Resources

The Tana River Delta is an important source of timber and other wood products. The delta is characterised with different types of vegetation (hyphaena compressa, cyprus dives, acacia-borassus aesthiopum), wetland resources, bushland and forests (mangroves). Local communities harvest timber and other products (firewood, charcoal, medicinal plants and honey) for subsistence and sale from the project site. The forests are valued at some Kshs. 250 million (*Mireri et al 2008: Socio-economic valuation of Tana Delta sugar Project report*)

The Tana delta is rich in mangrove forests important for the functionality of the area. The forests support a number of primate species. Of special concern are the "vulnerable"

Zanzibar galago (Lee *et al*., 1988) (*Galago zanzibaricus*), and the endemic subspecies of Tana Sykes (Kingdon 1971) (*Cercopithecus mitis albotorquatus*). The forests are home to four other primate species: grivet monkey (*Cercopithecus aethiops pygerythrus*), Yellow baboon (*Papio cynocephalus cynocephalus*), Garnett's galago (*Otolemur garnettii*), and Senegal galago (*Galago senegalensis*) (Butynski & Mwangi 1994). These forests are vital to the survival of a large number of other species, some of which are endemic, making the region one of Kenya's biodiversity hotspots.

The delta has many shallow lakes and wetlands resulting from meanders of the Tana and recharged through ground water seepage or by the periodic flooding of the Tana River. These are not only unique habitats but also provide food, livelihoods and social benefits to local communities. The basins of oxbow lakes and the deeper parts of dammed lakes where water remains for most of the year include Lakes Bilisa, Shakababo, Kongolola, Kitumbuini, Dida Warede, Harakisa, Moa and Kenyatta. In these lakes, profuse growths of true aquatic plants occur. The Nile cabbage or water lettuce (*Pistia stratiotes*) carpets the water surface and interspersed with it are the water lily (*Nymphaea lotus*) and the floating aquatic fern (*Azolla nilotica*). Lake Bilisa is an expansive wetland dominated by grasses, sedges, floating macrophytes and submerged macrophytes. The dominant plant species include aquatic grasses (*Bothriochloa bladhii, Echinochloa haploclada*), sedges (*Cyperus frerei, C. heterophylla, C. tuberosus*), floating macrophytes (*Pistia stratiotes, Azolla nilotica, Lemna* spp.) and submerged macrophytes (*Ceratophyllum demersum*). The lake has abundant bird life and fishing is a major activity with 145 tonnes of fish captured in 1990. The Orma people harvest aquatic grasses as fodder for their livestock. They also use sedges for thatching. While immigrant Luo and Luhyia undertake fishing. Lakes Shakababo and Kongolola have relatively clear waters and among the fish species that made up the 82 tonnes caught in 1991, were 'Barabara' (*Oreochromis mossambicus*), 'Chokole' (*Synodontis zambesiensis*), 'Pawa' (*Mormyrus sp.*), 'Pumi' (*Clarias mossambicus*), 'Borode' (*Labeo gregorii*), 'Kamongo' (*Protopterus amphibius*) and Mkunga' (*Anguilla mossambicus*).

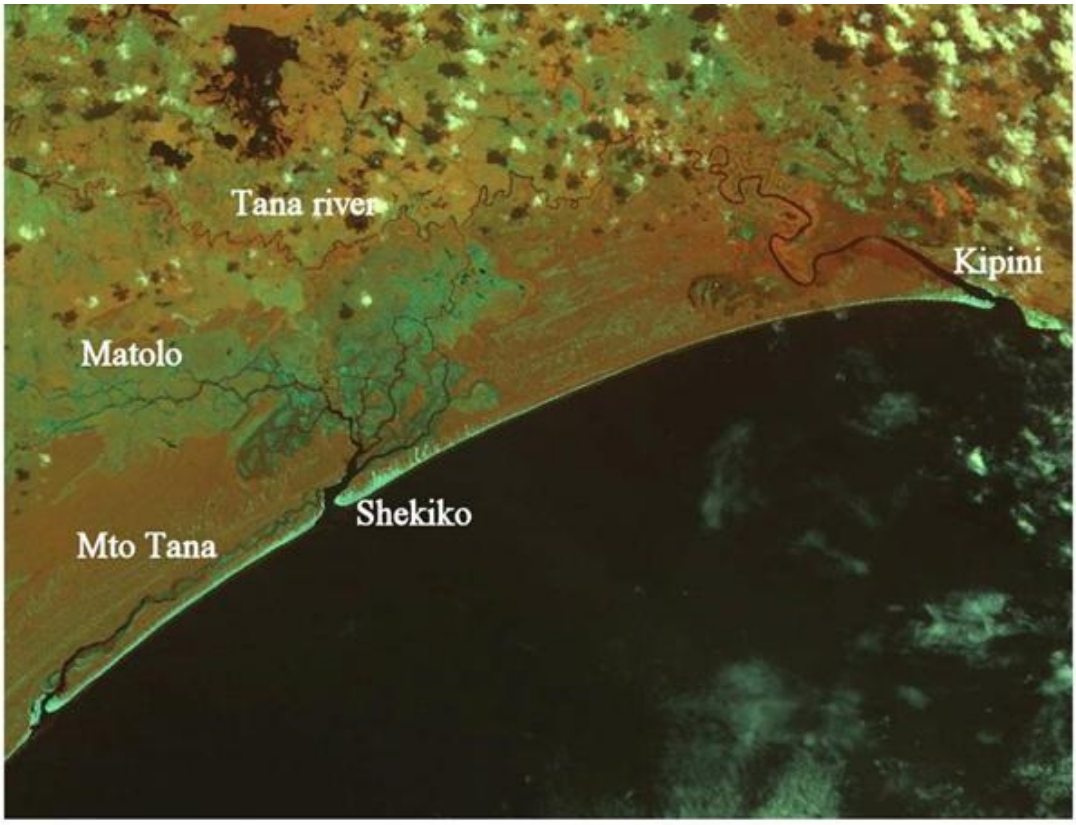


Plate: The mouth of Tana Delta at Ungwana Bay (http://www.vub.ac.be/ANCH/CV/tana.html).

Plants:

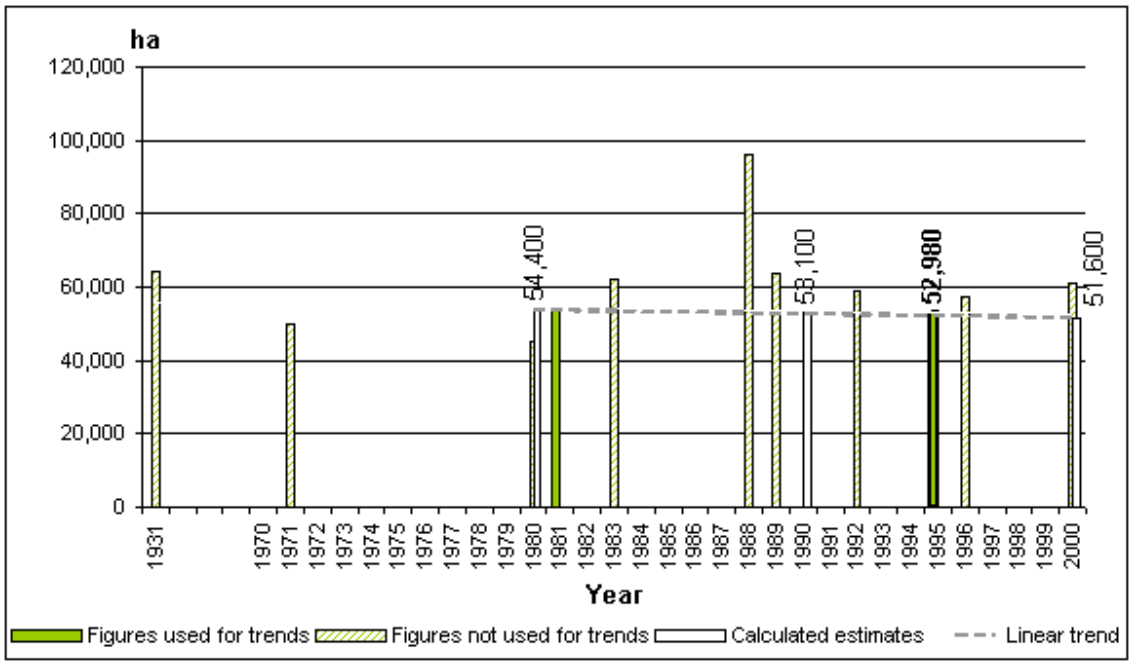
The lower Tana riverine forest is unique to Kenya being remnants of continental forests resembling western more than eastern African vegetation communities. An inventory of the woody flora and ecological study of 12 forest areas in the Tana River National Primate Reserve (TRNPR) described the composition and structure of this riverine forest ecosystem and identified patterns of regional and local diversity (Medley, 1992). Up to 175 species in 49 families have been recorded in the woody flora, but the geographic affinities of 98 species are from four major floristic regions in Africa: Zanzibar-Inhambane (31%), Somalia-Masai (16%), Guinea-Congolian (12%), and Zambezian (1%). Ten species are rare and/or disjunct. Important tree species in these forests included *Acacia elatior*, *Acacia robusta*, *Barringtonia racemosa, Tamarindus indica* and *Newtonia hildebrandtii*, common on inactive levees occurring toward the edge of the floodplain, and *Rinorea elliptica*, an understory species found on levees. Changes along the river in sediment deposition and hydrology explain the high diversity of

landforms and corresponding forest types in the lower Tana forests, but the absence of trees which are most important near Bura, *Acacia elatior*, and near Wema, *Barringtonia racemosa*, suggests that the regional diversity of the ecosystem is inadequately protected. The taxonomic uniqueness and low population sizes are partially explained by the geographic isolation of this forest community from the rain forests of central Africa and the Indian Ocean coast and its current distribution as forest patches (Medley 1992).

Small fragments of riverine forest, not nearly as extensive as the forests north of Garsen, occur along the present or former river courses. Approximately 67,000 ha of the Tana delta are covered by floodplain grasslands. A variety of grassland associations occur, including a widespread tall grass found in heavy black clays and areas with open water which is dominated by *Echinochloa haploclada* with *Bothriochloa glabra, Setaria splendida* and other less common species. Sedges (*Cyperus* spp.) are common in the wetter areas and they may be dominant in permanent swamps. In areas with more sandy soils and less risk of flooding, usually the levees associated with the old and present Tana River courses, a variety of grass species occurs. The two main grasses are *Digitaria alscendens* and *Sporobolus confunis*. A third grassland type is dominated by tall stands of *Panicum maximum* growing to a height of over 2m in places. On the inland side of the coastal sand dunes and mangroves, a salt tolerant grassland occurs which is dominated by the tough, spiky *Sporobolus spicatus* in association with the salt bush *Suaeda monoica*.

West of the flood-plain is a diverse bushland. Wooded bushland or grassland, with fire-resistant tree species, occupies a broad swathe east of the flood-plain, merging into the Boni forest vegetation to the north. Other bushland associations form a complex mosaic with the flood-plain grasslands.

The Tana delta has mangroves along the main river course between Ozi and Kipini (including large areas with tall *Heritiera littoralis* - about the only place in Kenya where these are found) and in the tidal delta south of the main river where mangroves (dominated by *Avicennia marina*, but *Rhizophora mucronata*, *Ceriops tagal*, *Bruguiera gymnorrhiza*, *Xylocarpus granatum*, *Sonneratia alba* are also found). Currently, mangrove biomass along the Kenya coast is on the decline, and all efforts are required to reverse such trend.



Trends on mangrove biomass in Kenya.

Traditional land-use practices of small-scale agriculture, pastoralism and fishing have maintained the ecological balance of the delta for thousands of years. However, increasing human influence has been very strong in the delta. Most notably, the draining of land for agriculture and the control of water flow for irrigation and hydro-power production has left their mark.

Biodiversity and Tourism

The Tana River Delta is an Important Bird Area (IBA); Key Biodiversity Area (KBA) and a Global Biodiversity Hotspot. The Tana Delta is also part of the Coastal Forests of Eastern Africa Hotspot. This stretches along the eastern edge of Africa, from small patches of coastal (riverine) forest along the Jubba and Shabelle Rivers in southern Somalia, south through Kenya, where it occurs in a relatively narrow coastal strip of about 40 kilometers in width, except along the Tana River where it extends about 120 km inland. This ecosystem thus is of global importance in biodiversity conservation.

The delta is home to rare, vulnerable, migratory and threatened species. Some of the unique bird species found in the area are Malindi Pipit, Basra Reed-warbler and Tana River Cisticola. Other important biodiversity resources found in the Delta are: hippos, crocodile, mangrove forests, fisheries and fisheries spawning grounds. Given the ecological importance of the area, it has been designated as an area of importance for bird conservation and other biodiversity making it to be a global hotspot for conservation of unique habitats, threatened species and sustenance of ecological services. These important biodiversity resources are crucial for tourism, research and national heritage.

Coastal forests of eastern Africa biodiversity hotspots **(**http://www.biodiversityhotspots.org/xp/Hotspots/coastal_forests/pages/biodiversity.aspx**)**

In addition, the tourist potential of the area is immense as exhibited by the location of the delta in one of the most important Kenyan north coast tourist circuit between Mombasa and Lamu. The tourist potential in the delta could be harnessed for improved livelihoods of the local communities. Tourism is estimated to provide some only Kshs.500,000 annually despite the potential that can only be compared with a virgin gold mine.

Birds

The Tana Delta is designated by Birdlife International as an Important Bird Area (IBA) important for more than 345 species of birds including the threatened Basra reed warbler and Tana River cisticola occur in the delta. This area is a stronghold for two Near Threatened, restricted-range species, *Anthus melindae* and *Acrocephalus griseldis* (probably its main wintering ground). *Circaetus fasciolatus* is uncommon in riverine forest, but has not been recorded in recent surveys. The wetlands, including the coastline and offshore islets, at times hold exceptional concentrations of waterbirds. Internationally important populations have been recorded here for no fewer than 22 species, making the delta one of the key sites in the country for waterbird conservation. The Tana delta also supports one of the very few breeding sites for colonial waterbirds in Kenya. This heronry is near Idsowe, south of Garsen, on Ziwa la Matomba, a seasonally-flooded lagoon where the birds nest in a thicket of *Terminalia brevipes*, usually between May and September but also at other times if the lagoon is flooded. Up to 5,000 colonial waterbirds of at least 13 species have been recorded nesting here, including *Anhinga rufa* (up to 100 pairs), *Ardea cinerea*, *A. purpurea*, *Egretta ardesiaca, Ardeola ralloides* and *Nycticorax nycticorax*, *Casmerodius albus*, *Mesophoyx intermedia* and *Egretta garzetta*, *Anastomus lamelligerus*, *Threskiornis aethiopicus* and *Plegadis falcinellus*, and *Platalea alba*. Mwamba Ziwayuu, a small coral platform offshore from the Tana estuary, is a resting site for significant numbers of *Sterna saundersi* and *S. bengalensis* that feed in Ungwana Bay. Regionally threatened species include *Casmerodius albus*; *Ephippiorhynchus senegalensis* (a regular visitor in small numbers, May to September) and *Turdoides squamulatus* (local and uncommon).

The Tana River cisticola (*Cisticola restrictus*) is endemic to the Lower Tana River, and the Malindi pipit (*Anthus melindae*) is endemic to the coastal grasslands of Kenya. Most of the other endemics are found in the mainland coastal forest of Kenya and Tanzania, including the yellow flycatcher

(*Erythrocercus holochlorus*), Sokoke pipit (*Anthus sokokensis*, EN), Clarke's weaver (*Ploceus golandi*, EN), and Mombasa woodpecker (*Campethera mombassica*).

Key bird species in the Tana Delta

Spur-winged Goose (*Plectropterus gambensis*)	Greater Flamingo (*Phoenicopterus roseus*)
Yellow-billed Stork (*Mycteria ibis*)	African Openbill (*Anastomus lamelligerus*)
African Spoonbill (*Platalea alba*)	Cattle Egret (*Bubulcus ibis*)
Great Egret (*Casmerodius albus*)	Intermediate Egret (*Mesophoyx intermedia*)
Great White Pelican (*Pelecanus onocrotalus*)	Pink-backed Pelican (*Pelecanus rufescens*)
Southern Banded Snake-eagle (*Circaetus fasciolatus*)	White-fronted Plover (*Charadrius marginatus*)
Lesser Sand Plover (*Charadrius mongolus*)	Marsh Sandpiper (*Tringa stagnatilis*)
Little Stint (*Calidris minuta*)	Curlew Sandpiper (*Calidris ferruginea*)
Sooty Gull (*Larus hemprichii*)	Slender-billed Gull (*Larus genei*)
Gull-billed Tern (*Sterna nilotica*)	Caspian Tern (*Sterna caspia*)
Lesser Crested Tern (*Sterna bengalensis*)	Saunders's Tern (*Sterna saundersi*)
Whiskered Tern (*Chlidonias hybrida*)	Mangrove Kingfisher (*Halcyon senegaloides*)
Brown-breasted Barbet (*Lybius melanopterus*)	Pale Batis (*Batis soror*)
Four-coloured Bush-shrike (*Telophorus quadricolor*)	Fischer's Greenbul (*Phyllastrephus fischeri*)
Basra Reed-warbler (*Acrocephalus griseldis*)	Scaly Babbler (*Turdoides squamulata*)
Black-bellied Glossy-starling (*Lamprotornis corruscus*)	Mouse-coloured Sunbird (*Nectarinia veroxii*)
Violet-breasted Sunbird (*Nectarinia chalcomelas*)	Zanzibar Bishop (*Euplectes nigroventris*)
Malindi Pipit (*Anthus melindae*)	

Mammals

Tana Delta is home to the Critically Endangered Tana red colobus (*Procolobus rufomitratus*), one of 25 primates faced with extinction globally. Also found here is the endangered Tana crested mangabey (*Cercocebus galeritus*). Species considered Endangered are in danger of extinction and their survival is unlikely if the causal factors continue operating unchanged. They include taxa whose numbers have been reduced to a critical level or whose habitats have been drastically reduced or altered. In case of the two Tana River primates, both issues of population size and habitat loss are at hand with the latter being responsible for the former. Further alteration of their habitat will certainly lead to extinction. Destruction of these forests may occur due to incompatible expansion of agricultural production through irrigation in the delta, which will not only destroy the endangered primate's habitat, but also accelerate climate change.

The 2001 primate census results (Suleman, Oguge & Wahungu, 2001) suggest a decline of the red colobus by one third from the previous census population estimate of 1994. The primates are important flagship species for this biodiversity hotspot. Though relatively tiny, this biodiversity hotspot boasts three endemic monkey species. Found only in small patches of gallery forest along the lower Tana River in Kenya, the Tana River red colobus (*Procolobus rufomitratus*) is represented by only about 736-838 individuals, while the Tana River mangabey (*Cercocebus galeritus*) has been reduced to only about 1783-2135 individuals (Suleman, Oguge & Wahungu, 2001).

Critically endangered Tana River mangabey (*Cercocebus galeritus*)

Nearly 200 mammals are found in the Coastal Forests of Eastern Africa hotspot, and 11 of these are endemic, including the endangered Ader's duiker (*Cephalophus adersi*), the Kenyan wattled bat (*Glauconycteris kenyacola*), and the endangered golden-rumped elephant shrew (*Rhynchocyon chrysopygus*). Larger mammals in the ecoregion are generally habitat specialists that take advantage of the forest patches, but cross to open savanna and grasslands. These include bushpig (*Potamochoerus porcus*), bushbuck (*Tragelaphus scriptus*), yellow baboon (*Papio cynocephalus*), elephant (*Loxodonta africana*), leopard (*Panthera pardus*), lion (*Pantera leo*), and caracal (*Caracal caracal*). Although their numbers have declined considerably, this area is still home to crocodiles, hippos, and elephants.

Herpetofauna (Amphibians and Reptiles)

New records for a number of herpetofaunal species were recently recorded for Tana River forests (Malonza et al. 2006). This rich herpetofaunal assemblage is as a result of high habitat heterogeneity that ranges from the grasslands, forest, woodland, to bushlands. The authors nonetheless indicate that more work is required for a comprehensive list of herpetofaunal species in the delta with possibilities of new species description. The authors recorded the lizard genus *Trachylepis* as most speciose among the reptiles, with *Trachylepis maculilabris* being possibly the most abundant diurnal reptile in the riverine forest. Of special importance are the rare species such as *Lygosoma tanae, L. mabuiiformis, Schistometopum gregorii, Crotaphopeltis braestrupi* and *Heliobolus neumanni*, which were collected for the first time in the area since the 1930's. *Boulengerula denhardti*, a caecilian is the only endemic species recorded thus far in the delta. But with more than 50 endemics in Coastal Forests of Eastern Africa Hotspot, possibilities of new finds are real.

Herpetofauna of the region has a high affinity to the lowland coastal forests and central African species. Notable examples are *Dendroaspis angusticeps, Dispadoboa flavida broadleyi, Pyxicephalus edulis, Afrixalus fornasinii, Chiromantis xerampelina* (coastal forests), *Rhinotyphlops mucruso, Trachylepis maculilabris* and *Python sebae* (sub–Saharan Africa). Records here show 16 species in five Amphibian families (Bufonidae, Microhylidae, Petropedetidae, Ranidae, Rhacophoridae and Hyperoliidae) and 23 species in nine reptilian families (Testudinidae, Gekkonidae, Chamaeleonidae, Scincidae, Lacertidae, Typhlopidae, Pythonidae, Colubridae and Crocodylidae) (Table 5).

Herpetofaunal list from the Tana River National Primate Reserve (Malonza et al. 2006)

Class	Family	Species
Amphibia	Bufonidae	*Bufo gutturalis*
		Bufo maculates
		Bufo steindachneri
		Bufo xeros
	Microhylidae	*Phrynomantis bifasciatus*
	Petropedetidae	*Phrynobatrachus acridoides*
	Ranidae	*Amnirana galamensis*
		Ptychadena mascareniensis
		Ptychadena mossambica

		Ptychadena schillukorum *Ptychadena anchietae* *Pyxicephalus edulis*
	Rhacophoridae	*Chiromantis kelleri* *Chiromantis xerampelina*
	Hyperoliidae	*Afrixalus fornasinii* *Hyperolius pusillus*
Reptilia	Testudinidae	*Geochelone pardalis*
	Gekkonidae	*Lygodactylus picturatus* *Hemidactylus platycephalus* *Hemidactylus mabouia*
	Chamaeleonidae	*Chamaeleo gracilis* *Chamaeleo dilepis* *Rieppeleon kerstenii*
	Scincidae	*Trachylepis maculilabris* *Trachylepis planifrons* *Trachylepis striata* *Trachylepis brevicollis* *Trachylepis varia*
	Lacertidae	*Heliobolus spekii spekii* *Heliobolus spekii sextaeniata* *Latastia longicaudata* *Varanus niloticus*
	Typhlopidae	*Rhinotyphlops mucruso*
	Pythonidae	*Python sebae*
	Colubridae	*Lamprophis capensis* *Philothamnus punctatus* *Philothamnus hoplogaster* *Crotaphopeltis hotamboeia* *Dipsadoboa flavida broadleyi* *Psammophis orientalis*
	Crocodylidae	*Crocodylus niloticus*

Tana River Delta Conservation and Development issues

Disputes over the rights to water and land are at the heart of the complex conservation problems facing the Tana River Delta. The importance of the area for conservation is widely recognised, but there is little agreement on the appropriate steps forward, and the site remains without any formal protection.

The numerous patches of riverine forest, woodland and bushland in the delta are edaphic in origin, and their continued existence depends on critical minimum levels of flooding. The flood regime has already been disrupted by five large water impoundments upstream (including Masinga Reservoir, IBA 30). A proposed new pair of dams to be built by the Mutonga-Grand Falls Hydropower Project has the potential for even more serious impacts (Butynski 1995). Environmental impact assessment suggested that the new dams would greatly reduce river discharge, silt deposition and the level of groundwater. However, the present design of the Low Grand Falls dam incorporates an artificial flood and sediment release facility. This is intended to release sediments and artificial floods twice a year, around April and November. Mutonga Dam will also have sand-flushing facilities (F. Ng'weno, *in litt*.). It remains to be seen how effective these measures are, and control of the decision-making for when and how floods will be released remains controversial.

A major rice irrigation scheme initiated in the Tana Delta by the Tana and Athi Rivers Development Authority, with funding from the Japanese Government collapsed but has recently been revived to produce food for staffing Kenyans. Some four thousand hectares initially under rice production by TARDA also collapsed during the el-nino rains but has also been revived to grow rice although officially marked for Sugarcane within an explanted coverage of 16,000ha. These schemes implemented without EIAs and without impact mitigation measures have damaged riverine forest and reduced grazing lands for local people. Other concerns familiar to large-scale irrigation schemes — the impacts of fertilisers and pesticides, and the increased incidence of diseases such as malaria and bilharzia — do not seem to have been seriously considered. The ecological impact study by Ecosystems Ltd. (1985) strongly recommended reassessment of the whole project concept, pointing out that there were more efficient ways of producing rice and much more appropriate ways of using the delta's resources than monopolising them for a single agricultural activity.

Environmental concerns do not seem to have been considered, either, in construction of the new, embanked road to Lamu across the floodplain near Garsen. Constructed without culverts (and presumably in the no-flood season!) it acts as a kind of dam, and has substantially altered flooding

patterns. Land south of the road now receives no flood-water, while north of the road forest is drowned and dying (Robertson & Luke 1993, Ng'weno 1993).

The two major distributaries into the delta proper, the Furaha and Kalota Brooks, are now blocked by barrages constructed by the local people. The Furaha was cut off in the late 1970s and the Kalota in 1988, in both cases after a drought year. The Ozi rice scheme depends on natural irrigation from river water pushed back by the tidal bore at Kipini, and the lowered river volume in time of drought raised fears that the Tana might change its course once again, abandoning the Kipini mouth entirely. Even if this did not happen, it was thought that the outflow of fresh water to the distributaries might result in salt water flooding the fields (O. Nasirwa, *in litt.*). In any case, the barrages have converted the Kalota and Furaha into saline creeks, and profoundly altered the ecology of the southern delta. With their fresh water cut off, the riverine trees are dying, the mangroves are shifting up-stream, and hippos and crocodiles have been forced to move. The freshwater grasslands are becoming saline and unsuitable for grazing. A sluice system to allow agreed amounts of freshwater into this part of the delta would probably solve these problems fairly simply.

Who owns the delta, and who should control its resources? The Witu Settlement Scheme is sub-dividing and allocating land between Witu and Kipini, in the north-eastern part of the site. The landless in Lamu and Tana River Districts are yet to be given priority when the plots are issued (Robertson & Luke 1993). There has also been a long-running and acrimonious dispute over the section of the delta south of the river, fronting the coast. This area had been earmarked by Kenya Wildlife Service in 1988 as a wetlands reserve. In part, this was in recognition of the outstanding tourism potential of the area, which has superb scenic and wildlife interest, a remote feel and unspoiled landscapes and beaches (e.g. Cheffings 1987). A portion of 20,000 ha was allotted in 1990 to a group ranch, Kon-Dertu, made up of around 100 people living near the delta. Kon-Dertu, saying that it lacked the funds to develop the area, promptly sold half the allocation to Coastal Aquaculture Ltd., who intended to develop their piece as a commercial prawn farm. Prawn farms are notorious for their extremely negative environmental effects, and the allocation was hotly disputed by many concerned for the conservation of the delta. Almost a year's raging controversy culminated in an announcement by Kenya's President Moi in July 1993 that the Tana Delta should be protected as a wetland of international importance. The land allocation was nullified, and a governmental Tana Delta Wetland Steering Committee set up to develop a management plan.

Over 15 years later, there is no progress towards this. An environmental awareness project has been carried out, which may have helped to defuse some of the strongly-held antipathy felt by the local community towards the Kenya Wildlife Service. However, no management plan yet.

Meanwhile, in the continuing state of confusion, environmental degradation in this recently pristine habitat continues apace. Destruction of woodland and mangroves, slash-and-burn agriculture, illegal hunting of wildlife and unregulated off-shore trawling are all diminishing the delta's resources. More disturbingly, there are reports of allocations of large chunks of land to private developers in what can be described as scramble for Tana delta and violation of local peoples rights over land and generally social dignity. The Tana Delta Steering Committee itself impotent to act.

In the meantime, tens of thousands of people would lose their livelihoods, and globally endangered birds and primates and crucial wintering sites for migratory birds would be lost if the rush of schemes in Kenya's Tana River Delta goes ahead. The site is even more threatened after a stop order on development was thrown out on a technicality by a Kenyan court this week, despite clear evidence that the scheme does not provide greater economic benefits than the alternatives. Conservationists and local agencies are working to promote an alternative development path for the Delta, incorporating eco-tourism and the enhancement of indigenous livelihood strategies.

The Tana River Delta has a history of poor environmental management and planning and promised major development schemes failing, most recently a rice scheme in the 1990s which left a legacy of environmental damage. In 2008 Kenyan conservationists went to court and secured a stay order against the Mumias Sugar Company who wanted to plant over 20,000ha of sugar cane in the wetland, displacing thousands of pastoralist people who depend on this area for dry season grazing. Since then Mat International Sugar Ltd is targeting to invest in sugarcane projects in Tana River and Ijara Districts. Both sugarcane projects aim to produce large amounts of ethanol for export to the European market. Now biofuel companies want to convert 160,000 hectares of the land immediately surrounding the delta into *Jatropha curcas* plantations. Qatar has asked Kenya to lease it 40,000 hectares of land to grow crops in exchange for support for a major new port in nearby Lamu

Paul Matiku, Director of Nature Kenya, says: 'The Tana River Delta is the largest of several critical wildlife areas threatened by development in Kenya. Kenya needs development, but not a scramble for our resources which destroys our wildlife, displaces pastoral tribes who have depended on the area for

centuries, dries our rivers and removes more sustainable longer term economic options such as fishing and ecotourism.

Paul Buckley of the RSPB, which has helped support Nature Kenya's defence of the Delta, adds: 'It is tragic to witness the risk of the riches of the Delta being squandered. The Delta suffered poor planning for decades and the river is already dry after recent droughts, even without these major proposed new irrigation projects. We hope that the world will help Kenya to develop the Delta in a way which harnesses its unique global assets, protects its wildlife and helps its people'

Paul Matiku adds 'We want to make the Tana Delta better known so that more people are aware of the risks to this little known but incredible wetland. These developments have not asked the views of the local people who are a diverse and talented community. When asked they express opposition to these proposals and request local officials and the outside world to instead help them improve their own lives and better market those things that they already produce.'

An economic study has already shown that a master plan which integrated better and more sustainable management of existing activities with a conservation-focused future development could generate more income and better livelihoods than these large and ill thought out developments.

Chapter 2

Principles, Goal, and Objectives

The challenges affecting Tana Delta are impacting negatively its ability to function optimally, thereby impeding its sustainable use and contribution to biodiversity conservation and socio-economic development in the area. In order to address the challenges, the Tana Delta Conservation and Development Master plan is guided by the principles contained in the National Wetlands Conservation and Management Policy:

The guiding principles

1. ***Wise use:*** Due to the significant contribution of Tana River Delta to the health and well being of Kenyans, Tana River Delta should be integrated into the national Protected Areas network and also the local and national economic planning for sustainable development, wealth creation and environmental and biodiversity management

2. ***Precautionary principle***: Where information is inadequate for decision making, the precautionary principle will apply. Lack of full scientific information should not prevent implementation of measures to minimise/ manage Tana River Delta degradation

3. ***Collaborative and participatory approach:*** An integrated approach to Tana River Delta conservation and management should involve stakeholders at all levels including; government, local community, civil society and the private sector.

4. ***The global dimension:*** the global dimension of environmental impacts of actions and policies should be recognised and considered

5. ***Polluter pays principle****:* Persons who pollute Tana River Delta environments should meet the cost of cleaning them up, and also meet the cost of the pollution to resource users.

Vision, purpose and strategic objectives

The goal of the Tana River Delta Conservation and Development Management Plan is to ensure wise use and sustainable management of Tana River Delta by and for stakeholders in order to enhance sustenance of Tana River Delta ecological and socio-economic functions for the present and future generations of Kenya and the world.

Specific Objectives

1. Enhance and maintain ecological functions and socio-economic values derived from Tana River Delta in order to protect biological diversity and improve livelihoods of Local Communities
2. Promote innovative planning and integrated management approaches towards Tana River Delta sustainable conservation and management

3. Establish an effective and efficient institutional framework for integrated management and wise use of Tana River Delta and create enabling environment for the participation of all stakeholders.
4. Carry out demand driven research and sustainable biodiversity and resource base monitoring on Tana River Delta to improve scientific information, knowledge base and inform biodiversity conservation, development agenda and general management objectives
5. Enhance capacity building within government and local community institutions involved in conservation and management of Tana River Delta.
6. Promote communication, education and public awareness among stakeholders to enhance their appreciation and participation in Tana River Delta conservation and participatory management
7. Establish a Tana River Delta information management system and database including tools and packages targeted to schools, the general public and private groups.
8. Engage private sector in the conservation and development agenda in the Tana River Delta.

Chapter 3

Management strategies: Importance, significance and values of Tana River Delta

Objective: Enhance and maintain ecological functions and socio-economic values derived from Tana River Delta in order to protect biological diversity and improve livelihoods of Local Communities

Tana River Delta Functions, Products and Services

Tana River Delta is known to perform crucial functions and provide vital products and services essential for environmental integrity and human well being in the area and Kenya in general. Being hugely diverse in its interactions, Tana River Delta has developed intricate relationships with human livelihood, the Indian Ocean and the general surrounding environment. Like in many wetlands in Kenya, these ecological and socio-economic values in Tana River Delta have not been valued in monetary terms but its innate contribution to conservation and development agenda is invaluable. Before the actual monetary contribution of Tana River Delta is properly valued it will take long and this management plan proposes management strategies based on the known and unknown values to ensure that current actions do not threaten the future survival of threatened biodiversity, the invaluable ecological goods and services and the direct socio-economic benefits for the people living around the Tana River Delta.

Tana River Delta Wildlife Habitats and Reservoirs:

Tana River Delta is a natural wildlife habitat for a variety of plants and animals some of which are of conservation significance including endemic, endangered and migratory species. Tana River Delta is also *in-situ* bank for genetic resources. Thus, the management of Tana River Delta for biodiversity conservation is critical.

Management strategies:

- Promote ecosystem based approach to the management of Tana River Delta
- Promote the sustainable exploitation of resources in the Tana River Delta
- Promote sustainable agricultural practices
- Zone strict conservation and multiple use areas
- Add value to Resources products to reduce wide scale exploitation
- Study the Tana River Delta resources birds and biodiversity and develop species action plans
- Monitor birds and biodiversity and produce annual status and trends report for management interventions
- Enhance the protection status of Tana River Delta to cushion future biodiversity losses
- Develop and initiate non-consumptive uses e.g. Tourism and carbon trading

Tana River Delta Natural products:

Fish and other food products:

Tana River Delta sustain commercial and subsistence/ artisanal fisheries. Its importance as fish nursery grounds and for replenishing natural stocks in Indian Ocean is well recognised. Fish farming within wetland areas is increasingly becoming an important alternative to natural production.

Management strategies:

- Promote efficient techniques and technologies for harvesting and processing fish and other food products within Tana River Delta
- Promote conservation measures that protect fish nurseries and breeding grounds in the Tana River Delta
- Promote fish-based businsses and add value for higher returns to local people and government
- Establish commercial fish farming for indegenous species

Wildlife and plant products:

Tana River Delta communities are increasingly harvesting wetland resources to enhance and improve their livelihoods. Wetland plants are harvested to provide materials for construction and thatching, the cottage industry, canoes, fishing baskets and traps. Wetland plants are also used for medicinal purposes and as a food source.

Management strategies:

- Determine and monitor the wildlife and plant based resources in the Tana River Delta
- Promote sustainable extraction and utilization of products derived from Tana River Delta
- Develop appropriate marketing infrastructure for wetland products for maximum benefits to the community.
- Estalbish user groups and develop regulations for access and extraction of widllife and plant resoruces in the Tana River Delta

Tourism and Recreation:

The nature and serenity of Tana River Delta makes it important ecotourism and recreation centre. The presence of a wide range of wildlife species as well as its aesthetic value makes Tana River Delta a unique attraction for tourism, which is an important foreign exchange earner at the national level and source of livelihood for local communities. The Kenya government has a plan to diversify tourism products and tourism attractions and Tana River Delta is strategically placed for this noble development at the Kenyan coast.

Management Strategies:

- Establish a tourism hotspot in the name of Tana River Delta Conservation Area and map it on the national tourist attractions map
- Promote development and establishment of recreation and eco-tourism facilities.
- Build government and local community capacity to manage the tourism activities including tour guiding. Bird tourism, boat rides, sport fishing and wildlife viewing has the highest

immediate potential and these products will be singled out and marketed nationally and globally.
- Produce and distribute tourism marketing materials
- Establish links and networks with the national and global tourism networks

Tana River Delta ecological values

Flood Control and Soil Erosion Prevention:

Tana River Delta act as sponge, absorbing excess storm from heavy rainfall, thereby ensuring flow regulation/ flood control and soil erosion prevention. Floodwater are stored in the soils or retained as surface water, thereby reducing floodwater volumes into Indian Ocean. In addition, Tana River Delta vegetation slows down the flow of floodwater resulting in silt and sediment retention and Indian Ocean protection. Besides reduction of flooding events downstream, this process also ensures slow and sustainable recharge of clean filtered water into Indian Ocean for which Kenya, depend for national and regional economic growth. The Tana River Delta vegetation also shields the soil from damage by strong waves and wind and is home to invaluable globally threatened biodiversity.

Management Strategies

- Enforce relevant national regulations and laws that promote maintenance of ecological integrity of Tana River Delta.
- Promote application of standard procedures and processes for developments with potential for changing the status of Tana River Delta.

Water Recharge and Discharge:

The retention ability of Tana River Delta enables sustainable water discharge and recharge into Indian Ocean. The impeded drainage allows the water to stay in one place long enough to maximize infiltration, enhancing recharge of Indian Ocean and groundwater and aquifers.

Management strategies

- Implement long-term water flow monitoring into and out of Tana River Delta
- Promote measures that ensure protection of water resources and sources
- Promote and encourage sustainable use of Tana River Delta waters.

Water Purification, Nutrient and Toxic retention

Tana River Delta vegetation absorbs nutrients and toxic substances from inflowing water from agriculturally active upstream areas thereby improving the quality of water in Indian Ocean. Nutrients and toxic substances originate from agricultural, domestic and industrial sources. The materials eroded in the watershed are filtered by the Tana River Delta vegetation resulting in water purification. The sediment retained in the wetland protects Indian Ocean and biodiversity resources. Sediment retention in the flood plains benefits agriculture by renewing nutrients and soil and creates unique habitats with unique fauna and flora.

Management strategies

- Institute measures for efficient waste management from point sources.
- Support and promote enforcement of relevant national regulations and laws related to environmental pollution.

- Develop Tana River Delta specific by-laws to government land management and production systems to reduce over fertilization and pollution of the Tana River Delta Waters
- Promote organic farming methods around the Tana River Delta and upstream in the water sources

Carbon Storage:

Tana River Delta is among the most effective ecosystems for carbon storage. The Tana River Delta vegetation takes up carbon from the atmosphere and converts it into plant biomass during the process of photosynthesis. In many wetlands, waterlogged soil conditions prevent decomposition of the plant material thereby retaining carbon in the form of un-decomposed organic matter (Peat). The long retention of carbon in wetlands prevents excessive amounts of atmospheric carbon, thereby reducing global warming. The retained carbon is easily released into the atmosphere wherever vegetation and peatlands are drained and exposed to fires.

Management strategies

- Promote and support conservation measures to maintain Tana River Delta vegetation and general ecosystem health.
- Institute measures to discourage the drainage of Tana River Delta
- Promote uses that allow Tana River Delta vegetation to provide ecological, biological and socio-economic benefits in a sustainable manner
- Develop capacity to tap carbon trading resources under the Climate Change Convention

Research and Education:

Tana River Delta is an important site for scientific research and education. There is urgent need to promtoe long term studies both local, national and global levels on environmental status and trends in the Tana River Delta. Research areas within Tana River Delta include ecology, archaelogy, ornithology, hydrology, geology, pollution control, medicine, agriculture, climatology, and paleolimnology and biofuel, among others.

Management stretagies:

- Establish and promote establishment of a Tana River Delta research and information centre
- Establish and promote linkages and partnerships with higher learning institutions both Kenyan and outside Kenya
- Promote studentship and studies that help students pursue their proffesional endeavours
- Publish regular education and research materials to provide continuous upto date information for better management of Tana River Delta.
- Initiate a school based education proramme in all the schools around Tana River Delta

Religious and Cultural Values and Significance:

Tana River Delta is an important historical site that comprise important components of the coastal community cultural heritage. Local communities have strong attachments to the swamp because of their social, cultural and spiritual importance. The communities also promote indigenous knowledge and practices on environmental functions and values that are essential for their survival.

Management strategies:

- Promote recognition and application of traditional indigenous knowledge in Tana River Delta management.
- Encourage community parcitipation through establishment of local management institutions and structures e.g. Site Support Groups (SSGs)
- Promote the conservation of Tana River Delta religious and cultural significance
- Produce education, awaness and research guides and publications in local languages.

Chapter 4

Management strategies: Theats and challenges in Tana River Delta

Objective: Promote innovative planning and integrated threat management approaches towards Tana River Delta sustainable conservation and management

While Tana River Delta has the potential of contributing significantly to the socio-economic development of Kenya, it faces a myriad of diverse and severe threats. Drainage for agriculture, land transformation, pollution and fertilization, unattainable resources harvesting, over siltation due to poor agricultural practices upstream, over flooding due to catchment degradation upstream, encroachment for settlement due to increasing demands for land and over removal of wildlife species especially fish and mammals. Private sector involvement is a major threat and there seems to be true scramble for the Delta resources without regard to the rights of indigenous local communities. Poor management and lack of or just the poor implementation of environmental laws and guidelines and climate change add to the Tana River Delta problems. These threats have induced changes that have eroded the ecological and socio-economic values and services derived from Tana River Delta. The underlying threat remains lack of recognition of the importance of Tana River Delta as a finite resource whose roles in both the national economy and community livelihoods is taken for granted.

The following issues have been identified as critical in addressing the challenges of Tana River Delta conservation and management:

Challenges and Threats

Reclamation and Conversion of Tana River Delta

Drainage and reclamation of Tana River Delta for agricultural development, human settlement and agricultural industrial development is one of the biggest threats to the conservation and management of Tana River Delta. In the past, Tana River Delta has been regarded as “wasteland” that should be converted to a useful asset mainly through drainage for agriculture. This has led to large-scale drainage and conversion for alternative uses without regard to ecological, biological and socio-economic values.

Management strategies:

- Drainage and reclamation of Tana River Delta will not be allowed unless a greater public interest is demonstrated within a framework of maintained ecological integrity of Tana River Delta.
- Tana River Delta will be zoned for multiple land uses restricting any degrading developments to the already opened up areas

- Any alteration of Tana River Delta for public interest will be subject to Environmental Impact Assessment (EIA), cost benefit analysis, and wide stakeholder consultations.
- Any conversion should be in harmony with the integrity of the Tana River Delta, and maintain the functions of the Tana River Delta.
- Undesirable developments and plant species that negatively impact the ecology and hydrology of the Tana River Delta will be disallowed, and where already introduced, will be replaced with appropriate developments and plant species.
- Uncontrolled burning of wetland biomass will be prohibited.
- Land uses that allow maintain ecological integrity within a sustainable development framework will be promoted.

Overexploitation of Tana River Delta resources

Increasing human populations and change from subsistence to commercial exploitation of Tana River Delta resources continue to exert increasing pressures, resulting in a decline of values and services and quality as well as quantity of ecological, biological and socio-economic products derived from Tana River Delta.

Management strategies:

- Abstraction of water will be strictly regulated and will require meeting laid down standards and regulations.
- Exploitation of goods and services from wetlands will be regulated to ensure the integrity of wetlands is maintained.
- Tana River Delta ecological goods and services will be valued and periodically reviewed to ensure sustainable off-take
- Extraction volumes of Tana Delta resources (water, fish and plant products), will be based on sustainable yields
- Limits will be set for non-consumptive uses of Tana River Delta to maintain the health and functioning of the system.
- Subsistence and environmental needs will take priority over commercial interests in the planning for resource access and extraction in the Tana River Delta

Pollution and Eutrophication of Tana River Delta

The quality of many water sources in Kenya is declining as a result of municipal, agricultural and industrial wastes/ discharges. These have negatively impacted water quality and biodiversity within the wetland ecosystems thereby reducing their values. Increased nutrient loads have led to eutrophication and episodes of algal blooms in most wetlands. In the Tana River Delta, excessive abstraction of waters, diversions, and catchment degradation, have led to reduced water quality and reduction on Tana River Delta goods and services.

Management Strategies:

- Appropriate measures will be taken to protect riverbanks and lakeshores.
- Dumping of waste in Tana River Delta will be disallowed and any disposal sites close to Tana River Delta subjected to Environmental Impact Assessment.
- In light of the agricultural developments and mechanisization, any effluent discharged into Tana River Delta will be regulated and treated to meet appropriate wastewater standards.

Where appropriate industries will be asked to treat and recycle their water as proof that safe standards are met.
- Environmentally friendly farming techniques that reduce nutrient, silt and pollutant loading in the Tana River Delta will be promoted.
- Public awareness including at household level on proper management of waste including reduction, reuse and recycling will be promoted.
- Coordination and enforcement of wetland and general environmental laws will be promoted.

Alien Invasive Species

Like many wetlands, Tana River Delta is highly vulnerable to alien and potentially invasive species. Many wetlands have in the past been affected by the introduction of alien invasive species that have altered the biodiversity characteristic and diminished the services provided by wetlands. Introduced species easily occupy new niches due to lack of competition and predators.

Management strategies:

- Introduction of alien and potentially invasive species without due appraisal of their potential impacts in Tana River Delta is prohibited.
- Conditions that are conducive for the establishment and proliferation of invasive species will be managed.
- Guidelines, regulations and procedures will be developed and enforced to control introductions of alien and genetically modified organisms.
- Public education and awareness campaigns on the dangers of alien species will be carried out, and stakeholders will be involved in the management of wetlands threatened by invasive species.
- Research collaboration with universities to promote understanding on alien species will be promoted to help develop strategies and actions to manage alien species.

Management strategies: Conservation and management

Objective: Promote innovative planning and integrated management approaches towards Tana River Delta sustainable conservation and management

Establishment of Tana River Delta Conservation Area

The ecological, biological and socio-economic benefits, values and services provided by the Tana River Delta are critical and must be maintained at all costs for posterity. There is no reason why Tana River Delta should guarantee these invaluable services in the long-term unless the management of the area is addressed. The Government has established parks and reserves to ensure that areas similar to the Tana River Delta are protected and managed sustainably however the Tana River Delta remain waiting for this conservation benefit.

Management strategies:

- Tana River Delta will be accorded protection and conservation status necessary for the maintenance of its functions that support existing indigenous local community multiple land

uses. Three levels of protection will be recognized: Nature Reserve—for strict protection in areas that will function as natural gene banks; National Reserve—for regulated consumptive and non-consumptive uses; and Community Conservation Areas (CCAs)—all current multiple land uses will be managed for reduced impacts on the environment. These CCAs will be entirely managed by the local communities—including the surrounding community areas where production activities for day-to-day livelihoods will take place. For such important wetland areas, consumptive uses will be prohibited**.**

- In designating such sites the representative nature of different services of Tana River Delta will be taken into consideration.
- Ensure the domestication and institutionalization of the Ramsar Convention
- List Tana River Delta as a wetland of international significance by subjecting it to the Ramsar critaria for which it obviously fulfills.

Restoration and Rehabilitation of Tana River Delta

Tana River Delta has many parts of it that have been degraded and are in dire need of repair through well tailored rehabilitation mechanisms. Upstream, there are serious environmental threats that threaten the invaluable ecological goods and services provided by the Tana River Delta through drainage, pollution, sedimentation and introduction of exotic species. These arise from the cathcment threats mainly arising from catchment degradation, over exploitation of resources, upstream damming and diversion among others. There are serious on site threats mainly resulting from land transformation for agriculture and these will be given attention.

Management strategies:

- Tana River Delta restoration and rehabilitation programs will be developed and implemented
- In restoring degraded areas the indigenous vegetation and other biodiversity will be given priority.
- As much as feasible, natural regeneration of resources will be allowed for degraded parts.
- Rehabilitated parts of Tana River Delta will be closely monitored to ensure maintenance of ecological integrity, functions and services.
- Advocacy programmes for upstream catchment rehabilitation will be developed and implemented through sectoral collaboration.

Tana River Delta Ownership

Tana River Delta ownership is under Government as trust land held by the local county in trust for the public and local communities. Private individuals and government agencies have also been accorded ownership through 99 year land leases mainly for agricultural intensification. The scramble for Tana Delta is unprecedented and at current rate the indigenous local communities will be reduced to squatters in their ancestral lands.

Management strategies:

- Ownership of Tana River Delta will be vested in the local communities with only a few sections designated for public interest in conservation and development and these will be subject to vetting by local communities for their continued benefits for posterity.

- Legitimate rights for land ownership will be accorded to true indigenous local communities to sustain their environmentally friendly multiple land uses in support of local livelihoods and national economies.
- Tana River Delta owing to its invaluable contribution to the pool of national and global commons (ecological functions and biodiversity values) will be declared a public resource.
- Appropriate buffer zones will be delineated within which human activities will be controlled.
- Environmental friendly cultural and traditional practices for use of Tana River Delta resources will be permitted.
- No privatization of any part of Tana River Delta. Developers will only be allowed into Tana River Delta through time bound negotiated leases after proofing zero environmental costs for their developments.

Management Strategies: Information Management, Education and Awareness, Monitoring and Research

Objective: Carry out demand driven research and sustainable biodiversity and resource base monitoring on Tana River Delta to improve scientific information, knowledge base and inform biodiversity conservation, development agenda and general management objectives

Inventorying, Monitoring and Information Systems

At the moment, there is a total lack of comprehensive monitoring system for Tana River Delta and as a result decisions affecting wetlands are based on inadequate information. Nature Kenya carries out annual monitoring and produces an annual status and trends report for IBAs including the Tana River Delta. However, there is no infrastructure, no capacity and no continuity in data collection and in any case the IBA monitoring focuses largely on the birds and their habitats. There is no monitoring for the ecosystem services and as result resource baselines are only a subject of undocumented traditional knowledge.

Management strategies:

- Tana River Delta conservation and management will be based on sound scientific principles.
- A full inventory of all Tana River Delta resources and services will be carried out to determine their quantities, type, status, values and threats. The information acquired must be made available to the managers and local communities in a form that they can be utilized.
- Monitoring protocols and data management will be developed, standardized and applied
- A Tana River Delta information center will be set up.
- Indigenous knowledge will be documented and incorporated in decision-making.
- Annual status and trends report for Tana River Delta will be produced

Management Strategies: Capacity building

Objective: Enhance capacity building within government and local community institutions involved in conservation and management of Tana River Delta.

Capacity and Human Resource Development
A key issue and problem leading to the uncontrolled past threats and loss of Tana River Delta ecological goods and services is the lack of government and local community capacity to stem the threats. Tana River Delta is not under any routine management regime and everything was left under the mercy of the exploiters. Traditional uses that are less destructive allowed the wetland a chance to thrive but this is no longer possible given the advent of mechanized agriculture. Institutional, human and local community capacities including skills to advocate and fight for indigenous rights are critical.

Management Strategies:

- Measures will be implemented to enhance the capacity for sustainable management through infrastructure and human resource development, communication and information provision.
- Empowerment and education of local communities will be promoted as cost effective and efficient method of inventorying and monitoring.
- Capacity for carrying out Environmental Impact Assessments (EIA) procedure on proposed wetland development projects will be strengthened.
- Local communities and Site Support Groups (SSGs) will be trained in institutional management, leadership and governance and knowledge management to ensure sustainable Tana River Delta conservation for posterity
- Infrastructure for inventorying, monitoring and management of Tana River Delta will be developed and applied.

Management strategies: Education and Public Awareness

Objective: Promote communication, education and public awareness among stakeholders to enhance their appreciation and participation in Tana River Delta conservation and participatory management

Tana River Delta is degraded because the public is either not fully aware or does not appreciate the diversity, finite, and fragility of its functions and values. Education and public awareness is essential to create commitment and positive attitudes towards conservation and sustainable utilization of Tana River Delta resources.

Management Strategies:

- Promote education and public awareness on Tana River Delta to encourage understanding and participation of the public, private sector, local authorities, NGOs and other interested parties through all appropriate means. .
- Incorporate Tana River Delta (as also other wetlands) conservation and management issues into the national environmental education strategy and other available and relevant systems
- Show case the sustainable wetland conservation model in the Tana River Delta

Management Strategies: Institutional framework for Tana River Delta Conservation and Management

Objective: Establish an effective and efficient institutional framework for integrated management and wise use of Tana River Delta and create enabling environment for the participation of all stakeholders.

Legal Legislative frameworks

The Kenyan Government has undertaken reforms aimed at conservation of environmental resources including wetlands. This includes enactment of legislations related to conservation and management of wetlands in the country. The relevant laws include the Environment Management and Coordination Act (section 42), the Lakes and Rivers Act cap 409, the Wildlife policy and Bills and the Water Act (2002) which deals with management, conservation and control of water sources.

The government has also developed strategies for water services development and water resources management. It has also gazetted regulations arrived at protection of wetlands. These include the EMCA Water Quality Regulations, 2006 that set stringent standards for effluent discharge into aquatic bodies. In-spite of the above reforms Tana River Delta is still greatly threatened by degradation.

Management strategies:

- Monitor and ensure implementation of the National Wetlands Policy in the Tana River Delta through development of appropriate site based regulations and by-laws
- Implement EMCA and other laws that have provisions for the conservation of wetlands like Tana River Delta
- Develop a Tana River Delta conservation and management manual with guidelines, regulations and procedures for all users
- Integrate Tana River Delta conservation concerns into district level planning

Institutional frameworks

No body is in control in Tana River Delta. As a result it has become a free for all resource. That free hold access and use cannot work in a world where resources are extremely limited, repair for environmental damage is high and public accountability and environmental ethics are low. Some

one must become in-charge and help the management of the resources to guarantee the services in perpetuity. Different aspects of Tana River Delta conservation and management are handled by different agencies, such as KWS, fisheries, water, regional development authorities, agriculture, local authorities, and communities, without clear legal mandate on any one of them. This has therefore meant that no single agency is in charge of overall coordination. This status highlights the fact that Tana River Delta has often been marginalized and regarded as "wasteland" and this neglect has contributed to massive wetland loss and degradation.

Management strategies:

- Request Kenya Wildlife Service (KWS) to manage gazetted sections and all fauna and flora in the Tana River Delta for posterity with benefits flowing to all stakeholders
- Establish a Tana River Delta Management Committee to guide implementation of this conservation and development master plan
- Gazette the Tana River Delta or parts of it as a National Reserve to legitimize the presence of Kenya Wildlife Service (KWS) as a manager of land, wildlife and people
- Establish local community conservation institutions e.g. Site Support Groups and build their capacity as stakeholders for the management of the Tana River Delta
- Establish user groups and build their capacity to ensure sustainable access and use for Tana River Delta resources

Management Strategies: Resource mobilization and private sector engagement

Objective: Engage private sector in the conservation and development agenda in the Tana River Delta.

Resource Mobilization

Sustainable financial resources have remained the principal impediment to promoting sustainable development and environmental protection. National budgetary resources have failed to adequately provide for wetland conservation and management. As a result, the country has been unable to effectively respond to challenges of wetland conservation and management.

Management strategies:

- Adequate and reliable resources to be mobilized from Government, development partners, private sector and other agencies to support conservation and management of Tana River Delta.
- Forge partnerships with the private sector to assist in the conservation and management of Tana River Delta.
- Develop and implement fundraising plans targeting access to multilateral funding institutions.

Non-State Actors

Some Non-State Actors, including Non Governmental Organizations (NGOs), Professional Associations, and Private Sector have in-depth experience in wetland related matters. Their experiences will be fully utilized through mechanisms to be jointly developed with the government. Collaboration between these actors, government agencies, and local authorities will be developed. Participatory wetland management will be enhanced, by involving concerned non-state actors and local communities in planning and implementation of Tana River Delta conservation activities.

Management strategies:

- The government will encourage non-state actors and local communities to undertake Tana River Delta conservation activities.
- NGOs and local communities will be included in the Tana River Delta Management Committee
- Non-state actors will be acknowledged as contributors when they provide support to managing government agencies
- Schemes for private sector involvement in Tana River Delta conservation and development agenda will be developed and implemented

Promoting International obligations

A number of International Agreements, Protocols and Conventions impact on wetlands. These include the Ramsar Convention, The United Nations Convention to Combat Desertification, Convention on Biological Diversity (CBD). Kenya appreciates positive impacts on sustainable wetland management and will continue to play an active role in their management and implementation.

The global implications of wetlands should therefore be considered in accordance with the regional and international agreements, conventions, protocols and other instruments in which the country has interest so as to recognize the multiple roles of wetlands and tap further investment in the sector from new international agreement.

Management strategies:

- Mainstream the provisions of relevant conventions and agreements into the Tana River Delta institutional frameworks
- Promote synergy and a coordinated national approach towards domestication of Multilateral Environmental agreements (MEAs) relevant to Tana River Delta
- Promote inter-site collaboration within Kenya and outside to ensure sustainable management of all wetlands in Kenya and beyond

Gender and youth issues

Traditional gender roles have inhibited the participation of women and youth in wetland management. Initiatives by women and youth have convincingly demonstrated the necessary and potential value of their participation in wetland management at the community level.

Management strategies:

- Endeavor to deliberately involve women and youth in participatory Tana Delta conservation, development and management.
- Encourage the proportional representation of the youth women, the vulnerable and marginalized groups in the management of Tana River Delta.

Management structure