

**COASTAL WETLANDS MANAGEMENT
PROJECT
(CWMP)**

SONGOR RAMSAR SITE

MANAGEMENT PLAN

By

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**PREPARED FOR THE WILDLIFE DIVISION OF THE FORESTRY
COMMISSION, DECEMBER 1999.**

TABLE OF CONTENTS

Table of contents		i
List of Tables		vii
List of Figures		viii
List of Appendices		ix
Preamble		x
PART 1.	DESCRIPTION	1
1.0	Description	2
1.1.	General Information	2
1.1.1.	Location, site description and boundary	2
1.1.2.	Land tenure	3
1.1.3.	Local perceptions of the site	3
1.1.4.	Additional Information	3
1.2.	Environmental Information	4
1.2.1.	Physical/Abiotic features	4
1.2.1.1.	Climate	4
1.2.1.2.	Hydrology	4
1.2.1.3.	Geology and soils	4
1.2.2.	Biological/Biotic Features	5

1.2.2.1	Flora	5
1.2.2.2.	Communities	5
1.2.2.3.	Fauna	6
1.2.3.	Cultural	7
1.2.3.1.	Past Land use	7
1.2.3.2.	Present Land use	7'
1.2.4.	Ecological Relationships and Implications for management	8
PART 2.	EVALUATION	9
2.0.	Evaluation	10
2.1.	Ecological Evaluation	10
2.1.1.	Size and position of the Songor Wetland	10
2.1.2.	Biological diversity	10
2.1.3.	Naturalness	11
2.1.4.	Rarity	12
2.1.5.	Fragility	13
2.1.6.	Typicalness	14
2.1.7.	Recorded history	14
2.1.8.	Potential for development	15
2.1.9.	Aesthetic, cultural and religious value	15
2.2.	Socio-economic evaluation	16
2.2.1.	Social and economic values	16
2.2.2.	Education and public awareness	17
2.2.3.	Public / Wise Use / Recreation	18
2.2.4.	Research	18
2.3.	Confrontation of values and interests / constraints	19
2.3.1.	Internal Natural Factors	19

2.3.2.	Internal Human Induced Factors	19
2.3.3.	External Natural Factors	20
2.3.4.	External Human Induced Factors	20
2.3.5.	Legislation and Traditional Factors	20
2.3.6.	Physical considerations	21
2.3.7.	Available Resources	21
PART 3.	OBJECTIVES	23
3.0	Objectives	24
3.1.	Long-term Management Objectives	24
3.2.	Factors affecting the achievement of the long-term Objectives	25
3.3.	Operational Objectives	25
3.3.1.	Objectives for Objective (d)	27
3.4.	Management Measures	27
3.4.1.	Measures for Objective (a)	27
3.4.2.	Measures for Objective (b)	28
3.4.3.	Measures for Objective (c)	28
3.4.4.	Measures for Objective (d)	29
PART 4.	ACTION PLANS / PRESCRIPTION	30
4.0	Action Plan / Prescription	31
4.1.	Zoning	31
4.1.1.	Zone A	31
4.1.2	Zone B	31
4.1.3.	Zone C	32

4.2.	Management Strategies	32
4.2.1.	Habitat / Species management	32
4.2.2.	Human Usage (Wise / Sustainable Use)	33
4.2.2.1.	Stakeholders	33
4.2.2.2.	Role of stakeholders	34
4.2.2.2.1.	Governmental Agencies	34
4.2.2.2.2.	Research Institutions	34
4.2.2.2.3.	Local Communities	35
4.2.2.2.4.	Private Sector	36
4.2.3.	Access, Education / Public Awareness	39
4.2.4.	Research	40
4.2.4.1.	Fisheries and aquaculture / Public Awareness	40
4.2.4.2.	Aquatic Ecology	40
4.2.4.3.	Ornithological studies	40
4.2.4.4.	Marine Turtle Studies	41
4.2.4.5	Aquatic mammals Studies	41
4.2.4.6.	Environmental Impact Assessment	41
4.2.5.	Training Needs	41
4.2.6.	Estate Management (Settlement and Infrastructure Development / Accessibility)	43
4.3.	Projects and Work Programme: Proposed Actions	43
4.3.1.	Strategies for the development of the Songor wetland	44
4.3.1.1.	Environmental Education and Public Awareness	44
4.3.1.1.1.	Expected Output	44
4.3.1.1.2.	Activities	45
4.3.1.1.3.	Development target	46
4.3.1.1.4.	Important Assumptions	46
4.3.1.2.	Rehabilitation and Sustainable Management	46
4.3.1.2.1.	Expected Output	47
4.3.1.2.2.	Activities	47

4.3.1.2.3.	Development Target	48
4.3.1.3.	Accelerated Growth, Eco-tourism and Infrastructure Development	48
4.3.1.3.1.	Improvement of Social Needs	48
4.3.1.3.2.	Improvement of Productive Activities	49
4.3.1.3.3.	Promotion of Eco-tourism	49
4.3.2.	Ornithological Programmes	50
4.3.2.1.	Research into Breeding Activities of Birds	50
4.3.2.2.	Bird Ringing Activities	50
4.3.2.3.	Personnel	50
4.3.3.	Aquaculture Programme	50
4.3.3.1	Aquaculture of the Black Chin Tilapia and Volta Clam	50
4.3.3.2.	Personnel	51
4.3.4.	Marine Turtle Programme	51
4.3.4.1	Personnel	51
4.3.5.	Afforestation and Agro-forestry Programme	51
4.3.5.	Personnel	52
4.3.6.	Public Education Programme	52
4.3.6.1.	Personnel	52
4.3.7.	Eco-tourism and Biodiversity Conservation Programme	53
4.3.7.1.	Personnel	53
4.3.8	Hydrological Improvement Programme	54
4.3.8.1.	Personnel	54
4.4.	Monitoring and Review	54
4.4.1.	Biological Monitoring	54
4.4.2.	Socio-economic Monitoring	55
4.4.3.	Policy Monitoring	55
4.5.	Additional Information	56
4.6.	Cost Implications for Management Strategies	57
4.7.	List of Material Needs	59

4.8.	Time Table for Implementation	61
4.8.1.	Objectives Implementation	61
4.8.2.	Projects and works Programme Implementation	62
5.0.	PUBLICATIONS CITED AND REFERENCES	63
6.0.	APPENDICES	65 - 74

LIST OF TABLES

Table 1.	Major Economic Activities and their yearly yields	16
Table 2.	Songor Ramsar site - Site Management Committee Members	37
Table 3.	Staff Strength at Songor Ramsar site	42
Table 4.	Estimated Budget for the Management Strategies	57
Table 5.	Objectives Implementation Schedule	61
Table 6.	Projects and Work Programmes Implementation Schedule	62

LIST OF FIGURES

Figure 1.	Songor Ramsar Site - Ecologically sensitive areas	5A
Figure 2.	Songor Ramsar site - Proposed Management Zones	31A

PREAMBLE

Ghana's wetlands receive significant number of migratory birds from a greater breeding range than most wetlands in West Africa. This is because the country is on the boundary of two flyways of waterbirds, the East Atlantic Flyway and the Mediterranean Flyway (Smit and Piersma, 1989). At least 15 species of waterbirds occur in internationally important populations (Piersma & Ntiamoa-Baidu, 1995). Eight wetland sites along the Ghana coast (Esiama, Elmina, Muni, Densu delta, Korle, Sakumo, Songor and Keta) qualify as internationally important wetlands on the basis of the total populations and species of waterbirds they support (Ntiamoa-Baidu & Gordon, 1991). In 1992, five of these sites (together covering 1685.05 km²), Muni, Densu delta, Sakumo, Songor and Keta, were proposed as Ramsar sites and received support from the Global Environment Facility (GEF) for their protection under the Ghana Coastal Wetlands Management Project (CWMP), executed by the Wildlife Department.

The CWMP aimed at preserving the ecological integrity of the selected coastal wetlands, while at the same time enhancing the socio-economic benefits of the wetlands to local communities. The management strategy advocated is therefore based on the "wise-use" concept of the Convention on Wetlands of International Importance (Ramsar Convention). Beside birds, products of these Ramsar sites are subjected to human exploitation and therefore are of socio-economic importance to society. These include mangroves and other wood products, fish, grasslands for livestock grazing and rice farming, water supply, and opportunities for recreation and tourism.

For over ten years, Ghana has been a signatory to the Ramsar Convention. "wise use" of wetlands is understood to mean "their sustained utilization for the benefit of humankind in a way compatible with the maintenance of the natural properties of the ecosystem".

Although the Government of Ghana has overall managerial responsibility for wetland

areas, the involvement of the communities in the management of the wetlands, through community consultations, education and awareness creation cannot be over emphasized.

The long term objective of this document, "Management Plan for the Songor Lagoon" is to integrate wildlife management with the use of the site by local communities and promote the wise use of the resources on sustainable yield basis without adverse impact on the resources and the environment in general.

The document is based on background information prepared during environmental baseline and monitoring studies undertaken by a number of institutions including consultants from the University of Ghana, Ghana Wildlife Society, and the Water Research Institute of the Council for Scientific and Industrial Research.

PART 1. DESCRITPION

1.0 DESCRIPTION

1.1 GENERAL INFORMATION

1.1.1 Location, site description and boundary

Although Ghana ratified the Ramsar Convention on 22nd June 1988, Songor Ramsar was listed as Ramsar site in 1992. The Songor Ramsar site as shown in Figure 1, is located in the Dangme East District of the Greater Accra Region in Ghana. It includes the Songor lagoon which is one of the two lagoon systems (the other is Keta lagoon) associated with the Volta River Estuary. The lagoon is closed off from the sea (Kwei, 1977; Mensah, 1979) and is situated to the west of the Volta Estuary (05⁰49'N, 00⁰28'E; See Fig.2). The lagoon can be approached by road from three directions: Ada Foah in the east along the coast to the villages of Pute and Totokpoe which are situated on the edge of the lagoon; from the west through Sege, Anyaman to Lolonya village and from the north through Koluedor and Bonikope. The open water covers an area of ca. 115 km² and extends ca. 20km² along the coast and ca. 8km inland behind a narrow sand dune on which villages like Pute and Totokpoe are situated.

The Songor wetland comprises a brackish water lagoon with extensive mudflats and islands, a broad sandy beach in the south and flood plains with degraded mangroves and coastal savannah vegetation. The lagoon is shallow, the deepest part in October 1994 was about 50 cm and most areas were less than 10 cm (Piersma & Ntiamoa-Baidu, 1995). The land around the lagoon is low-lying, with the highest point less than 10m above sea level. The general elevation does not exceed 75 m above sea level in the northern part and 15 m above sea level near the coast. The coast is generally smooth without cliff.

1.2 Land tenure

The indigenous people in the area are the Ningos in the west and Adas in the east. Land is owned by kingship groups or families and held in custody by the elders of each group.

The land is either sold outright to a potential owner or leased and renewed yearly.

Depending on the nature of the project to be undertaken, the clans can give the land free of charge. For instance, the CWMP bungalow plots were given free of charge by the communities.

1.1.3 Local perceptions of the site

Perceptions on the site depends on the natural resources that the communities obtain from the area. For instance, in the eastern section more fishing activity occurs and so more value is placed on fishery resource. In the western and northern portion more value is placed on salt winning while crop farmers are more interested in the catchment area.

Before the onset of the CWMP, the communities placed no value on wildlife. The situation seems to have changed now due to education and public awareness of conservation of the natural resources.

1.1.4 Additional Information

The added value of the Songor Ramsar site as a tourist center due to the presence of birds and turtles has now generated much interest in the area by the communities. The owners of the land restrict fishing, farming and salt winning at certain periods to preserve the ecology of the wetland. The estuary at the site provides water sport and is increasingly attracting visitors during weekends. The Asafotufiam festival celebrated by the people of Ada in August also attracts both residents outside and tourist to the site.

1.2 ENVIRONMENTAL INFORMATION

1.2.1 Physical/Abiotic Features

1.2.1.1 Climate

Temperatures are high throughout the year and range between 23 °c and 33°C. Rainfalls are heavy during the major rainy season between March and September. The average rainfall is 750 mm. Relative humidity ranges from 60% in the dry season to 80% in the rainy season. Evaporation ranges from 5.4 mm to 6.8 mm and is very high during the dry season (November -March). This is attributed to the proximity to the sea, the Volta River and other water bodies.

1.2.1.2 Hydrology

A number of small streams including the Sege and Zano, drain directly into the Songor although several small dams have been constructed on the streams for water supply. Channels, which in the past provided direct connection with the Volta River, are effectively blocked naturally by siltation. The lagoon has no direct access into the sea and the sea water replenishment results from seepage through the sand dunes. Thus, salinity varies over a broad range through the year (100 ppt in the main lagoon and 27 to 31 ppt in the seepage and water channels) (piersma & Ntiamoa-Baidu, 1995).

1.2.1.3 Geology and soils

The major part of the Songor Ramsar site is underlain by Dahomeyan rock, which consists predominantly of gneiss, schist and migmatite. The rocks weather into grey calcareous clay and silt, which are permeable. Unconsolidated sand clay and gravel occur in the deltaic areas of the Volta River as well as in areas surrounding the Songor Lagoon.

Five different soils have been identified at the site. Ada Association found along the estuary and the island (which is acidic). Tropical Grey Earth, and Songor Association, are found in areas around the lagoon. *Goi Association*, and *Agantaw Association* are found in the eastern end of the lagoon. The northern section is composed of Tojeh Association (Dangme East District Assembly, 1994).

1.2.2 Biological/Biotic Features

1.2.2.1 Flora

The vegetation is largely degraded and the terrain is characterised by farms, secondary growth on abandoned farms, and eroded lands invaded by Neem *Azadirachta indica*, and isolated trees like Fan Palm *Borassus aethiopum*, Mango *Magnifera indica*, Silk cotton Tree *Ceiba pentandra* and Baobab *Adansonia digitata*. There are no emergent plants in the lagoon. The flood plains are dominated by *Paspalum vaginatum*, *Cyperus articulatus*, *Sesuvium portulacastrum*, and *Eleocharis mutata*.

1.2.2.2 Communities

Five main vegetation types are identifiable in the Songor Wetland:

- saline marshes on parts of the mud and salt flats;
- low degraded mangroves, mainly *Avicennia africana*, along the margins of the lagoon;
- waterlogged grassland;
- riverine woodland and scattered thickets of shrubs, climbers and
- small trees on higher ground.

See the Map of Songor Ramsar Site in Figure 1.

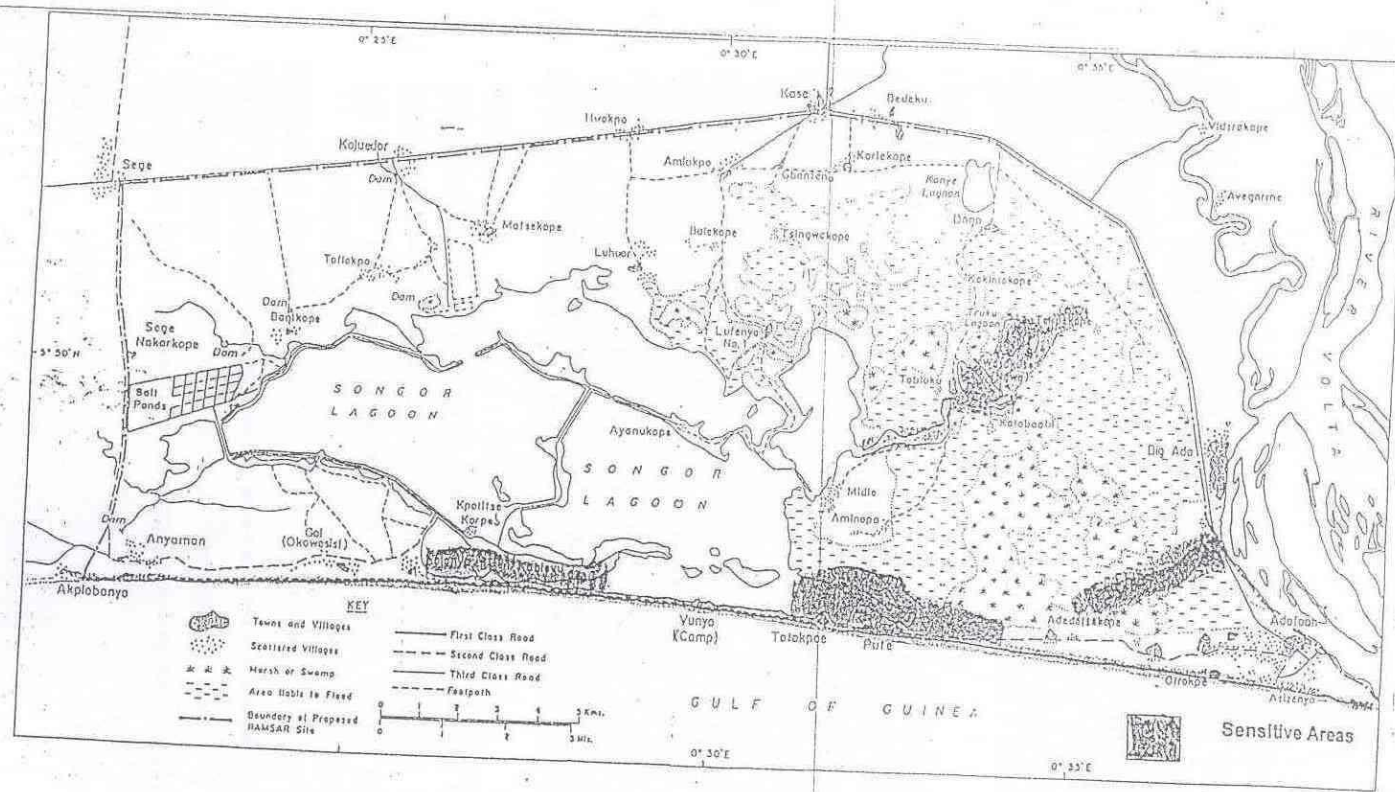


Figure 1 — Songor Ramsar Site (Ecologically Sensitive Areas)

1.2.2.3

Fauna

The soft mud is rich in nutrients and contains Amphipods and Gastropods. Oligochaetes and Polychaetes are also abundant in the mud (500/m²) (Piersma & Ntiamoa-Baidu, 1995). Phytoplankton, zooplankton and blue-green algae constitute the base of the food chain.

The common fish species encountered in the lagoon are the black chin tilapia *Sarotherodon melanotheron*, red chin tilapia *Tilapia guineensis*, a fish predator, *Hemichromis fasciatus* and lagoon crabs (mainly the swimming crab, *Callinectes amnicola*).

Songor Ramsar site serves as grounds for feeding, roosting and nesting for migratory and resident birds. According to Dickson (1998), the ecosystem supports about fifty-seven species of birds and the highest recorded numbers are for the terns (estimated to be 32,112) notably the Roseate tern *Sterna dougallii*, Avocet *Recurvirostra avosetta* and resident Black-winged Stilt *Himantopus himantopus*; Greenshank *Tringa nebularia* (1,074); Curlew sandpiper *Calidris ferruginea* (1,049). The site is the most important area for terns along the coast of Ghana (Piersma & Ntiamoa-Baidu, 1995). The site is also noted as the best breeding grounds for marine turtles, three of which are protected. These are the Leatherback, (*Dermochelys coracea*) Olive Ridely (*Lepidochelys olivacea*) and the Green Turtle (*Chelonia mydas*).

Common reptiles found in the area are the Royal Python *Python regae*, the common lizard *Agama agama* and the Monitor lizard *Varanus niloticus*. There are also a number of undocumented records of mammals and insects (pers. com., Dickson Agyeman – site officer).

1.2.3 Cultural

1.2.3.1 Past Land use

Past land use systems include subsistence crop farming, animal rearing, fishing, hunting, salt wining and fuelwood collection since most of the communities living in and around the wetland depend on firewood for their energy needs especially for fish smoking.

1.2.3.2 Present Land use

The present land use system does not differ much from the past. Human populations are clustered around the wetland, which provide significant food resources for the people.

Consequently, human settlements are concentrated along the coast and around the northern edges of the lagoon. The present land use in the Songor area includes farming, animal rearing, fishing, salt collection, recreation, settlement and associated constructions such as roads. Farming, fishing and salt winning are the main occupation of the people. The Kodragbe and the Dangme Biaweh clans own the land. About 30% of the lagoon area have been developed for salt production. Thus, sea and fresh water entry at this section of the lagoon is managed by the salt industry. The Salt Industry Management pays royalties to the Tekpeh Biaweh clan that owns the lagoon.

Main crops cultivated include cassava, maize and vegetables (particularly okra, pepper, and tomatoes). Small-scale livestock production is common in all the villages, with pigs being the most popular in the coastal villages, although small numbers of chicken, goats, ducks, and sheep are also kept. Cattle are grazed extensively on the grasslands in the north. Fishing is undertaken in both the lagoon and the sea, the latter being a major commercial activity, which extends into sacred areas. Bushes are burnt to hunt for small mammals and this encourage the regeneration of fresh grasses for livestock.

Over fishing and habitat alterations associated with human activities exert critical pressure on the vulnerable habitats and resources of the wetland. Fuel-wood collection, salt winning, crabbing, mat weaving from reeds, cattle grazing account for the various land use.

1.2.4 Ecological Relationships and Implications for management

The Songor wetland can be used to demonstrate the fundamental linkages between conservation and the preservation of vital ecological processes such as the water and mangroves. The invertebrates in the water serve as food for the numerous waterbirds especially the waders. Herbivorous birds like the ducks also find food from the few floating vegetation in some parts of the wetland. The fry, fingerlings and adult fish species found in the wetland serve as food for the piscivorous birds and local communities living in and around the wetland. During the dry periods the exposed dried mud flats are used by the local people to dry fish but this is detrimental to the roosting birds especially the terns as there is competition between the terns and humans for space which results in the terns leaving their roosting areas. This disturbance apparently leads to decrease in tern numbers. The mangroves forest also serve as habitat for most of the herons and the cormorants. Apart from this the mangroves are used as fuelwood by the local communities and their removal may destroy the habitats of some of the birds.

The burning of vegetation to encourage the growth of grasses for cattle grazing may also affect the ecological integrity of the wetland as new communities may take over and change the whole ecosystem.

PART 2: EVALUATION

2.0 EVALUATION

2.1 ECOLOGICAL EVALUATION

2.1.1 Size and position of the Songor Wetland

The Songor Ramsar site is the second largest wetland in Ghana, and covers an area of 51,133.33 hectares. The wetland constitutes the western portion of the Volta Estuary providing good location for tourism development. However, the site falls in a low-lying area (the highest point being less than 10m above sea level) making it prone to flooding. It comprises a brackish water lagoon with extensive mud flats and low islands, a broad sandy beach in the south, and flood plains with degraded mangroves and Coastal Savannah vegetation. Short to medium grasses, few trees and thickets characterize the site requiring intervention.

The wetland consists of a closed Songor Lagoon which serves as a wintering ground for resident, migratory birds (en route the East Atlantic flyway) and other wildlife species and needs to be preserved. Presently, terns, waders and herons in particular are not seriously threatened by human activities (Agyeman, pers. comm.). Any adverse effect on them could largely be attributed to the ecology of the area.

2.1.2 Biological diversity

There has been considerable damage to the vegetation, resulting in vast areas of depleted farmland, abandoned farms, wastelands and eroded terrain. Only isolated trees like Fan Palm *Borassus aethiopum*, Mango *Magnifera indica*, Silk Cotton Tree *Ceiba pentandra* and Baobab *Adansonia digitata* remain.

There are indications of over exploitation of major fish stock leading to low species composition left in the lagoon which is dominated by the black-chin tilapia,

Sarotherodon melanotheron, *Tilapia guineensis*, *Tilapia zillii* (in this order of importance), and juvenile marine species. There are also few shellfishes including the swimming crab, *Callinectes amnicola*, the shrimps, *Parapenaeopsis atlantica* and *Penaeus spp.* and the snail, *Tympanotonus fuscatus*.

Local information that the 'water sometimes turns pink' suggests the possibility of natural *Artemia* (brine shrimp) populations, which could be considered for small-scale aquaculture.

Songor Ramsar site constitutes diverse habitat type ranging from mudflats, coastal savannah, brackish water and the lagoon. The blocking of creeks that supply brackish water to the lagoon, conversion of wildlife habitat into farms and salt pans affect the diversity in a negative way. The site needs to be managed to restore the water flowing system, encourage mangrove planting and zoning of grazing areas to restore the ecology of the area.

2.1.3 Naturalness

The site has the only natural point at which the Volta River enters the sea. This serves as an entry and exit route for seasonal migratory fishes. The most natural plant communities include the *Avicennia africana* and *Rhizophora racemosa* and *Paspalum vaginatum* which serve as breeding and roosting site for cormorants. The mangroves also trap sediments, reduce erosion and serve as spawning grounds for fishes. The Songor Soil Association, which is saline, is covered with *Sesuvium portulacastrum*, and serves as a breeding ground for Little terns *Sterna albifrons* and Pratincoles *Glareola pranticola*. The site has abundant reeds and are used by the White face tree ducks *Dendrocyna viduatta* as nesting and feeding grounds.

2.1.4 **Rarity**

The site has rare birds and other animal species that are listed in the IUCN Red Data List and are protected in Ghana. Some examples of the protected animals are the leatherback *Dermochelys coriacea*, olive ridley *Lepidochelys olivacea*, the green turtle *Chelonia mydas*, roseate terns *Sterna dougallii* and the avocet *Recurvirostra avosetta*. The wetland also supports internationally important populations of seven species of waders: Spotted Red Shank *Tringa erythropus*, Green Shank *Tringa nebularia*, Ringed Plover *Charadrius hiaticula*, Curlew Sandpiper *Calidris ferruginea*, Little Stint *Calidris minuta*, Avocet *Recurvirostra avosetta* and Black-tailed Godwit *Limosa limosa*. The site has the highest total tern count on the Ghana coast and supports nationally important populations, (over 10% of the total coastal count) of at least 23 species of water birds (Piersma & Ntiamoa-Baidu, 1995). Over 80% of the total number of species recorded in Songor are Palearctic migrants. Migrant birds begin to arrive on the site in late August, and their numbers peak in September-November. The birds start to leave the area at the onset of the dry season, when large sections of the lagoon dry up; by January, the bird population is less than 5% of the autumn peak (Piersma & Ntiamoa-Baidu, 1995).

The coastal environment of the lagoon and wetlands taken together are sufficiently extensive and ecologically rich to provide the animal and vegetable food requirements for many different "feeding guilds" of shoreline birds. Unfortunately, the breeding and roosting sites of these species are constantly being degraded globally by human activities.

Threats to the ecological integrity of the Songor lagoon can be placed in the following categories:

- Water regime (i.e. water diversion, siltation, flow disruption by roads);
- Water pollution (i.e. solid and domestic waste, agricultural run-off);
- Physical modification (i.e.: land reclamation, salinisation of soils, clearance and fire);
- Over-exploitation (i.e. fishing, fuel wood, hunting birds and mammals, grazing and recreation).
- Natural phenomenon (drought and heavy rains).

2.1.5. Fragility

The ecosystem of the wetland is fragile. The ecological functions are highly vulnerable to flow disruption leading to loss of wetland ecological function. The loss of mangrove cover due to increased erosion and siltation, lead to loss of aquatic habitats. The long drought that affects the ecological zone encourages seasonal bush burning, loss of plant and animal species. There is a need for hydrological layout to prevent loss of habitats due to high salinity. Community based activities like creek clearing, trees and mangrove planting, controlled bush burning can help limit fragile trend of the site. Salt winning could make the habitat fragile for breeding and roosting birds.

Increasingly, there are industrialists and other interested bodies wishing to invest in the area. These stakeholders include those wishing to invest in large scale salt production, surface mining, estate development or tourism. While economic development must be encouraged, potentially there are major questions of compatibility of interests between such development and environmental conservation.

Ecologically sensitive areas within the Songor Ramsar site include the small area of stunted white mangrove found in the east. Also, the area of replanted mangrove near Obane.

Creeks serve, as refuge for freshwater fish coming from the Volta Estuary. However, these are blocked with grasses and trees limit brackish water entry into the lagoon. Furthermore the stretch of the beach between Prampram and Ada is the most important breeding area for three species of marine turtles.

The mud-flats off Totope which are highly susceptible to sea erosion are important roosting areas for terns and feeding area for waders and need to be protected.

2.1.6 Typicalness

The climate and plant species composition, render the site unique within the country. The vastness of the area and the different habitat types make it special for certain animal species in the country (e.g. marine turtles, which breed, on the Songor sand bar). There are long rows of sandbars which facilitate roosting sites for terns and feeding of wading bird is enhanced by the shallow waters. However, a number of factors mitigate against the typicalness of the area. For example, there is evidence of water seepage (Ntiamoa-Baidu & Gordon, 12991). The seepage raises the water level making it difficult for feeding waders. Furthermore, channels dug by local people for fishing create deeper waters unsuitable for the waders.

2.1.7 Recorded History

The site is noted for salt production and transport on the lagoon to neighbouring communities. The inhabitants are known to be very good fishermen, travelling extensively in the Gulf of Guinea in pursuit of their trade. Many people travel from afar to the site to purchase salt.

The Akosombo Dam, built in 1964, slowed down the flow of the river down stream and subsequently reduced the volume of water flow into the lagoon. The tidal regime was altered which affected the aquatic ecosystem. Grasses have blocked water channels and creeks. The growth of new plant species such the Neem *Azadirachta indica*, has led to loss of original habitats affecting birds and other wildlife species.

In order to improve the inter-tidal exchange, dredging of the river is being undertaken by the Volta River Authority. This has improved water accessibility to the otherwise grass covered creeks and channels. It is apparent that the dredging be encouraged and the facility extended to other blocked creeks and channels.

Due to the salt production potential, there has been a history of conflict between the local authorities, the salt industrialists and the Government. For instance, in the Ghanaian Chronicle issued on 27th October 1999 the Government of Ghana was "ordered out of Songor Lagoon". This conflict is under resolution.

2.1.8 Potential for improvement

The potential exists for encouragement of local people in environmental conservation, such as is possible with suitably prepared Eco-tourism and Environmental Conservation Plans.

Key areas requiring improvement are as follows: (i) capture fisheries in the lagoons, (ii) fish culture (including clams and brine shrimp), (iii) small-scale salt production industry, (iv) handicraft development, (v) brick and tile manufacture, (vi) sanitation and (vii) drinking water. Considering that the creeks are the only link between the lagoon and the Volta River, clearing the channel by the communities and dredging of some portions (specifically Futue and Luhue creeks) will enhance the flow of water all year round, which will improve water management for the fisheries and agriculture. In addition, the provision of sluice gates for the Songor Lagoon will improve water management for fishing and agriculture.

2.1.9 Aesthetic, cultural and religious value

The vastness, vegetative cover of reeds and mangroves along creek banks indicate the aesthetic value of the area. The large concentrations of birds and the presence of monitor lizards and turtles are added values. The site is noted for the origin of the Dangbe people and is accorded the highest cultural and spiritual value. This is marked by various sacred and fetish grooves. The spiritual head set norms, which indirectly conserve bio-diversity.

2.2. SOCIO-ECONOMIC EVALUATION

2.2.1 Social and Economic Values

The population of the Dangbe East District, to which the Ramsar site belongs, was estimated as 94,290 in 1997. Urbanization was 15% in 1994 with agricultural dependency US\$62% and fisheries dependency of 6%. The GDP Capita in 1994 was US\$360 and 250-poverty index (Tettey, 1995).

Local people value the site not for birds themselves but for the exploitable natural resources that contribute to their livelihoods and economic well being. Traditional utilization has taken the form of lagoon and marsh fishing, salt collection, crop production (including vegetables), animal rearing, and fuel-wood gathering.

In recent years industrial salt production has increasingly dominated local production. This has been a mixed blessing for the local people. While the salt industry on the one hand creates job opportunities, the creation of evaporation reservoirs has on the other hand marginalized artisan salt producers and fishermen. Table 1 below provides a summary of the major economic activities and their yearly yields:

Table 1: Major Economic Activities and their Yearly Yields (Tettey, 1995)

Major activities	Major producers	Yields (tons/year)
Salt	Salt Production Task Force	550
Salt	Local communities	230
Fish	Local communities	220
Tomatoes /other vegetables	Local communities	80
Fuel wood	Local communities	45

Sand winning from the beaches has been prohibited by Environment Protection Agency. Clay mining is concentrated in Vume-Sogakope area where pottery manufacture is undertaken. Production is mostly artisanal, using hand moulding techniques and baking in open wood fires. In Vume, pottery production is aimed at the overseas export market as well as domestic market.

The local population is not restricted from taking resources within any area. Over 80% (i.e. 56,000) of the total local population depends on the site for their livelihood in terms of fishing, farming, salt winning and reed cutting for weaving (Tettey, 1995).

The site is one of the leading tourist areas in the country and Eco-tourism has the potential for development.

From the community perspective, the real costs of conservation are the sacrifices made and benefits foregone as a result of restrictions imposed on traditional livelihood-enhancing activities. It is thus important to also view the site from local stakeholder perspectives and assess the use value of the wetland, both priced and non-priced, to different groups of local people and other stakeholders. Local stakeholders, of course, are not a single homogenous group but include different clans, social groups and genders whose interests are not necessarily identical. In view of major variations in income level between local stakeholders, the numbers of people directly affected may also be important.

2.2.2. Education and public awareness

Much effort has been made under the CWMP in creating public awareness and education on conservation issues in the communities living in and around the site to understand and appreciate the conservation of the wetland and its resources. Through lectures, seminars, video shows, community consultations and discussions the communities and the general public at large will be sensitized on the fragility of the wetland as a habitat for waterbirds

and as the repository of the wealth of the local communities. The Wildlife Department of Ghana, Ghana Wildlife Society and the Greenearth Organization have been undertaking education and public awareness progress. Community heads and opinion leaders are occasionally trained in basic conservation through workshops and seminars. The involvement of the youth in the conservation of the wetland and its resources cannot be over emphasized. As such Wildlife Clubs and Ghana Wildlife Society members groups have been formed in schools and communities to educate and encourage them to get involved in conservation issues. The idea is that once sensitized, they may grow up with an appreciation of the conservation of the wetland and thereby ensure its protection. Most of the community leaders are members of the Site Management Committee and they also play an important role in awareness creation as they inform their communities about conservation measures. These educational activities may help to advertise the site and its potential to the outside world. I

2.2.3 Public Wise Use/ Recreation

Recreational potential of the area is very high, however, the facilities are poorly developed and do not sustain any employment opportunities of significance for local communities except in the eastern side where some development has taken place. At the estuary, there are chalets and hotels for water sport. Opportunities exist for bird watching as well as sun basking.

2.2.4 Research

Environmental baseline studies have been carried out under the CWMP on ornithology, aquatic ecology, fisheries, socio-economics, and limnology. Water Research Institute of the Council for Scientific and Industrial Research (CSIR) is undertaking Shrimp and Aquaculture Development .Studies at the estuary for Scientific and Industrial Research. Development Options Studies have also been undertaken.

2.3. CONFRONTATION OF VALVES AND INTERESTS / CONSTRAINTS

2.3.1. Internal Natural Factors

The most natural trends in the site are the invasion of the creeks by grasses, thus blocking the flow of water to the lagoon. The long drought, experienced in the country in recent times, reduce the water level and result in subsequent invasion by other plant species. The sea, threatening the nesting habitats of the marine turtles, fast erodes the coast. Eggs and breeding site of water fowls are destroyed periodically by seasonal floods.

2.3.2. Internal Human Induced Factors

The internal human induced factors can be summarized as follows:

- Expansion of salt works by the Salt Industry is likely to take over major ecological habitats.
- The over exploitation of mangroves, other tree species and fish stocks and over grazing contribute to erosion and siltation of the creeks and lagoon.
- River and creek courses are dammed, and this obstructs the flow of fresh water into the lagoon.
- Conversion of ecological habitats into vegetable, rice and sugar cane farms.
- Dumping of refuse and other waste into the lagoon to reclaim land for building, the beaches and in the surrounding communities causing environmental hazards.
- Grazing cattle occasionally trample and destroy eggs of breeding birds. Also, it causes increased erosion and siltation as the vegetation is destroyed.
- Chemical pollution by crop farmers along the creeks, over fishing, killing, trapping, and collection of eggs of Marine Turtles are factors that threaten biodiversity.
- Sand winning along the beach for construction activities destroys the beauty and

renders the beach vulnerable to erosive forces.

2.3.3 External Natural Factors

Excessive heat evaporation and long periods of drought, currently experienced by the country, lead to the drying of water in the lagoon earlier than expected resulting in the loss of water loving plants and their habitats. This also affects bird species that depend on the plants. The high salinity in the lagoon also has a negative effect on aquatic life and lead to high natural mortality of fish in the dry season.

Sea Level Rise resulting from global warming causes coastal erosion of about 1.5 meters per annum (Ntiamoah-Baidu and Gordon, 1991).

2.3.4 External Human Induced Factors

Fertilizer and chemicals used by farmers outside the site enter the drainage channels into the lagoon. If not controlled this can lead to eutrophication and chemical pollution. The courses of major rivers that supply fresh water to the lagoon have been dammed upstream for irrigation and livestock. This prevents maximum water flow into the lagoon during the rainy season. Fishing (May-November), and salt winning (December-March) seasons attract people from all over the region. The population almost doubles (from 50,000 to over 90,000), leading to over exploitation of fishes, mangroves and other wetland resources. The habitat of birds and other wildlife species are subsequently destroyed.

2.3.5 Legislation and Traditional Factors

Although Ghana is a signatory to the Ramsar Convention, which she ratified in 1988, under which five coastal areas have been listed as Ramsar sites in 1992, it was not until recently (December 1999) that all the sites including the Songor were "gazetted". The

District Assembly has laws that regulate the use of resources, land, and waste disposal. In addition, the traditional priest and council have norms governing the use of resources at the site. There are national Wildlife laws that protect animals and restrict hunting during the breeding season (August-December). The Environmental Protection Agency (EPA) also has bylaws guiding new developments in the area. However, there is no body or Agent enforcing any of these at the site.

The site has therefore no independent laws, but operates within the jurisdictions of traditional and district norms and laws. Although these norms exist, they will not be obeyed by everybody especially the Christians and those influenced by the western culture.

2.3.6 Physical Considerations

The site is a low land and poses no problem to road construction. The main road at the northern section of the site is a first class road. Approaching the lagoon from the east (Ada-Foah) and the west (Sege) are also first class roads. A well-maintained second class road links the northern section of the site. However, the coastal communities (Kablevu, Totope, Kpotitsekope etc.) are highly inaccessible during the rainy season. Other communities within the lagoon environs (Medie, Aminapa and Taminor) have no access roads.

2.3.7 Available Resources

The World Bank through the Global Environment Facility funds the site under the Wildlife Division, which is the implementing institution of the Coastal Wetlands Management Project. The Government of Ghana provides counterpart funding and pays employed staff on the project. However, the project ends on 31st December 1999. There are small grants from Ramsar Secretariat to NGO's to undertake community education

and assist in replanting degraded mangroves and other tree species. The level of expertise and competence of the human resources is adequate for the wetland though some improvements are needed to upgrade the skills of the junior staff. However, lack of the necessary equipment and adequate incentives to staff demotivates them to give off their best. There is adequate housing for staff but no visitor facilities.

There is the urgent need for developing self- sustaining projects and strategies that will generate Income to sustain activities and gains made by the Wildlife Division.

PART 3: OBJECTIVES

3.0 OBJECTIVES

3.1 LONG-TERM MANAGEMENT OBJECTIVES

The formulation of management objectives is governed primarily by the Policy statement of the Ghana Government for Wetlands.

The long-term management objectives advocated for the management of the Songor Ramsar Site are;

- a To maintain diverse habitats necessary to conserve significant species and groups of species
- b To educate and create awareness on issues concerning conservation of biodiversity in particular and environmental issues in general among and within the local communities to solicit their support and co-operation for the protection of the site.
- c To integrate wildlife management with the use of the site by local communities and promote the wise use of the resources on sustainable yield basis without adverse impact on the resources and the environment in general.
- d To develop the potential of Songor as a venue for education, research, tourism and recreation.

In general the site should have open public access for cultural, touristic, educational, scientific, spiritual or inspirational reasons. Forms of traditional land-use, which are compatible with and contribute to the site's conservation, are to be encouraged.

The conservation objectives of the site will allow for the realisation of benefits to the local communities to win support for the site and to help offset real and perceived costs resulting from its establishment.

3.2 FACTORS INFLUENCING THE ACHIEVEMENT OF THE LONG-TERM OBJECTIVES

A summary of the factors which will influence the achievements of the long term objectives are:

- Ignorance of the values of the ' wetlands by the communities
- Absence of clear cut bye laws to protect the site
- Ineffective patrolling caused by poor access, ineffective staff development and lack of equipment.
- No public relations programmes with local people.
- Poaching of birds/turtles and mangroves.
- A less motivated staff of WD
- Exploitation of mangroves (as fuelwood) leading to deforestation and loss of habitat.
- Inadequate financial resources.

3.3. OPERATIONAL OBJECTIVES

In accordance with the stated policy it is proposed that the management of Songor Wetland will be guided by the following specific objectives:

3.3.1 Operational Objectives for Objective (a)

- Prevent encroachment of the site immediately.
- Reduce encroachment of the site by the end of year 3.
- Start restoration of mangrove after year 2.
- Institute sustainable land-use practices in the site to help protect it and expand economic options by the end of year 2.
- Restrict access to roosting and breeding areas of the waterbirds immediately.

- Collaborate with Forestry Division in reforestation programmes.

3.3.2 Operational Objectives for Objective (b)

- Develop educational programmes for the public regularly with immediate effect.
- Involve local communities at all levels in the decision making process of the site.
- Establish lines of communication between the local communities and the site management.
- Restructure the SMC to include other stakeholders by the end of year 2.
- Involve the media in public education and awareness creation by the end of year
- Encourage and involve NGOs in education and public education awareness creation. I

3.3.3 Operational Objectives for Objective (c)

- Establish levels of wise use on sustainable use of the resources such as fish, fuelwood in 5 years.
- Establish community woodlots in years 2 and 3 to supply fuel wood to the local communities.
- Introduce improved farming practices like agro forestry by the end of year 2.
- Develop management zones within the site.
- Encourage fisheries and aquaculture to reduce over exploitation of the fisheries resources by the end of year 4/5.
- Encourage Private Sector Investment in Eco-tourism, salt industry etc. to generate revenue for development within the communities by the end of year 5.

3.3.4 Operational Objectives for Objective (d)

- Increase accessibility of the site for tourism, education and recreation.
- Establish an information centre to provide information to visitors, tourists and students.
- Provide the infrastructure necessary to realise the potential of the site for tourism and recreation by the end of year 3.
- Assist to build the capacity of institutions within the area (traditional authorities, opinion leaders, etc) whose activities impact on the wetland to enhance the conservation of the site by the end of year 5.
- Assist the District Assembly to come out with a development plan (or upgrade if one already exist) for the communities to enhance the development of tourism infrastructure by end of year 3 or 4.

It is recommended that these general management operational objectives are reviewed within five years of their acceptance to determine if revisions to policy or management strategy is required.

3.4 MANAGEMENT MEASURES

The measures to be put in place to enhance the realization of the set of objectives for the Songor Ramsar Site are:

3.4.1 Measures for Objective (a)

- Intensify patrols in the site to protect the site from inappropriate developments, exploitation, fire and pollution.
- Demarcate appropriate management zones within the site to provide proper recognition and facilitate protection of the wetlands resources and habitats.

- Engage forestry division to devise enrichment strategies for restoring the mangrove vegetation.
- Introduce agro-forestry practices.

3.4.2 Measures for Objective (b)

- Educate farmers on the harmful effects of fertilizer grazing, pesticides and bush fires on the site and impress upon them to use alternatives such as manure, agro- forestry, etc.
- Organise workshops, seminars, etc. in the first half of the first year.
- Use billboards, posters, print and electronic media.
- Form environmental committees in the local communities.
- Establish an Information Centre.

3.4.3 Measures for Objective (c)

- Provide alternative sources of fuelwood by encouraging the local communities to establish 1 ha woodlots each year for five years.
- Research into wise use limits or sustainable levels of the sites resources (fish, salt, mangroves) and discuss wise use with the communities.
- Promote opportunities for local communities to benefit directly from the wetland, through revenue sharing, employment and access to sustainable harvest of resources e.g. fish, salt, mangrove, grazing land.
- Introduce sustainable fishing practices in collaboration with the Water Research Institute - Council for Scientific and Industrial Research.
- Carry out research on the bio-diversity in the site.

3.4.4

Measures for Objective (d)

- Construct visitor facilities
- Improve more observation points and improve upon existing ones.
- Encourage visits by schools and promote Songor as a venue for research.
- Construct a field laboratory/research centre.
- Establish sign posted nature trails well through the mangrove area and along the river.
- Encourage the development of facilities by local people, business community for regulated leisure activities

PART 4. ACTION PLAN/PRESCRIPTION

4.0 ACTION PLAN / PRESCRIPTION

4.1 Zoning

Because of the high human interest in the Songor wetland, zoning should be applied to encourage wise use of the resources and the sustainability of the wetland. Three zones are proposed as shown in Figure 2.

4.1.1 Zone A

This is the core area which is located in the south and covering 0.3 km² is regarded as the most important feeding and roosting sites for waterbirds. Human activities include fishing and drying of fish on sand flats in small sections of the area. Here, the Wildlife Tasks Forces and the communities should monitor and restrict grazing access to the nesting areas during the breeding season of the resident birds (May - mid July).

This area should be well sign posted with billboards to communicate the limitations in the various areas. Development of new settlements within the area should be discouraged.

Refuse should be collected from the area and disposed outside the area. There should also be limited artisanal salt winning.

4.1.2 Zone B

This zone includes the north to northeastern sections of the open lagoon with the surrounding floodplain. It is a marshland and a suitable breeding ground for some of the waterbirds and therefore a sensitive area. It also has a high attraction to salt developers. Any intensive industrial salt development will gravely affect the wetland ecosystem and should be discouraged. However, controlled artisanal salt collection within the area may

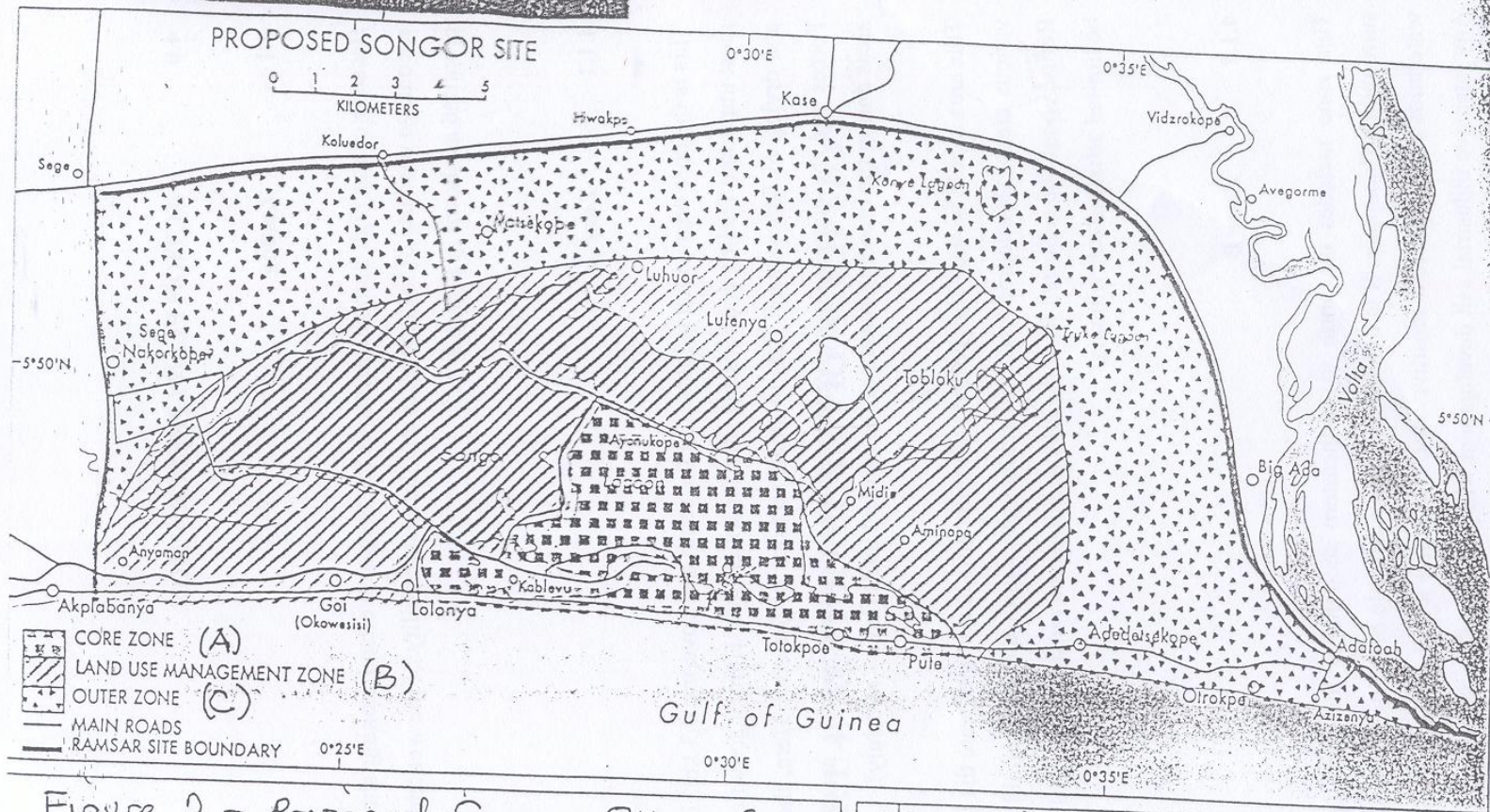


Figure 2 - Proposed Songor Site (showing Zones)

be permitted. Other compatible land use forms such as aquaculture could be explored and encouraged within the area. (See Map in Figure 2).

The use of agro-chemicals in farming should be discouraged and instead, promote the use of manure and agro-forestry.

4.1.3 Zone C

This zone comprises of the settlements. Growth cannot be restricted, however, the settlers must be educated on the principle of “wise use”. With human activities intensified in this zone, waste disposal should be efficiently, managed to enhance tourism and public health. There is the need to develop a District Development Plan (land use and village / town layouts) and to enforce its implementation.

On the whole, combined team of the SMC, Wildlife Division and the general public forming community watchdog groups should enforce the District Assembly by laws on land use practice that take cognisance of the need for sustainable development. A rewarding should be developed and implemented to enhance the enforcement of the by laws.

4.2. MANAGEMENT STRATEGIES

4.2.1. Habitat / Species Management

For restoration and an improved ecological habitat the following management measures can be adopted:

- Dredge and clear the blocked 22km creeks /water channels by two communities (Obane and Totimekope) within the eastern section of the site to improve brackish water flow into the lagoon to sustain aquatic life (to be organized by Wildlife Division).

and SMC) by end of year 3.

- Replant 0.05 km x 11 km stretch of degraded mangrove areas along creek banks by the joint effort of the Forestry Division, and the four communities to restore the breeding /roosting sites for the cormorants at the eastern section of the site by end of year 3.
- Provide 10 refuse receptors in communities along the lagoon by the District Administration to ensure communities reduce spill over into the lagoon and water channels
- Create ridges (using simple tools such as hoes, shovels, etc) for nesting birds to avoid seasonal flood washes. This activity can be done by the Wildlife Division staff on site in conjunction with the communities

4.2.2 Human Usage (Wise / Sustainable Use)

4.2.2.1 Stakeholders

Regardless of whether the responsibility of managing the wetland is fully assigned to a specific agency (Wildlife Division), it is a fact that such management affects various groups in the society. First among all these groups include the communities who live within or close to the wetland and, in particular, the people who use or derive an income from the resources. Others are people who possess the capacities and aspirations that are relevant for management, and the people who recognize in the wetland a unique cultural, religious or recreational value.

Apart from the local residents and resource users, other actors who may have interest in the management of the Songor wetland include the governmental agencies dealing with various resource sectors (e.g., forests, fisheries, agriculture, Fire Service, tourism) and the administrative authorities (e.g., the District Assembly) dealing with natural resources as part of their broader mandate. They include local businesses and industries (e.g. tourist operators, water users, etc., private sector), who can significantly be affected by the status

of the resources of the wetland; research institutions and non-governmental organizations which find the relevant territories and resources at the heart of their professional concerns.

4.2.2.2 Role of Stakeholders

There is the need to promote participation of four main stakeholders for the sustainable use of the resources at the Ramsar site. These are:

4.2.2.2.1. Governmental Agencies

The identifiable relevant government agencies who have a stake in the site and should be involved in the management are: Ministry of Food and Agriculture, Fire Service, Forestry Division, Dangme East District Assembly, Department of Community development, Health and Environmental Division of the Ministry of health and Population Council. The main role of these governmental agencies is to provide the expertise and make them available to the management effort. However, the District Assembly will among others offer support and provide the political backing to programmes drawn for the management of the site.

4.2.2.2.2. Research Institutions

These include the Universities, Research Institutions and the Ministry of Environment, Science and Technology and NGOs (e.g. Ghana Wildlife Society). These would carry out research studies on relevant issues to update and review the ecological information about the site.

4.2.2.2.3

Local Communities

These include the traditional authorities, opinion leaders, local community-based groups and associations and individuals. The local communities are the direct beneficiaries of the values of the wetland and therefore must be involved in the management of the resources to ensure their sustainable utilisation. The communities will provide labour force for conservation and sanitation activities. Apart from this, it is only when the communities understand well, the issues and lend their support for the conservation efforts, that the resources may be used sustainably. They could then team up with the Wildlife Division to offer protection to the site. Community involvement and integration will depend ultimately on establishing lines of communication to gain support and using incentives to strengthen that support. At the same time the communities will have to be made aware of the responsibilities and accountability they will have to assume with regard to the wetland. The traditional authorities, opinion leaders and the community-based groups could help in the education and public awareness creation. Apart from the SMC village level conservation committees should be established with local chiefs and others from the communities to serve as the link between the community and the SMC.

In the management of the wetland, the landowners must be adequately compensated through arrangement of royalties to be paid to them. If every interest group is made to see and enjoy the benefits of the new strategies/policies in their everyday lives, they will defend the implementation of the strategies.

Economic and other incentives help generate support as they provide clear reasons and justifications for local involvement in the wetland management. In reality, community wetland management cannot be dissociated from the local economy. As such, the concept of the Community Investment Support Fund (CISF) which is operational must be encouraged. Through CISF, local groups within the site and the catchment areas have been assisted through the provision of loans to improve upon their micro enterprises. This has contributed to poverty alleviation, improved living standard and reduced pressure on

the existing resources. A total of 16 groups comprising 475 people (254 women and 221 men) have benefited from the fund. Under the CWMP a total amount of ~214 million has so far been disbursed. In addition, the local beneficiaries have been trained to enhance the effective management of the loans. The beneficiary groups undertake biodiversity activities like tree planting, mangrove regeneration, creek channel clearing, creek bank planting, turtle conservation and education. These activities have helped to increase the awareness amongst the people and their responsiveness towards environment in general.

However, low recovery rate of the loans and natural factors (e.g. drought, too much rains, etc.) may hinder the smooth operation of the fund.

Table 1 gives a brief idea of the economic gains from the area by the various economic groups. Their inclusion therefore will win the confidence and support of the people in the measures being implemented and their views and well being will be taken care of to prevent loss of natural wealth and contribute in the fight against poverty.

4.2.2.2.4. Private Sector

These include the NGOs, religious bodies, hoteliers, private developers, industrialist, and the local media. These would undertake projects that will promote eco-tourism, conservation, education and public awareness and poverty alleviation. Encouraging the private sector participation and private investment will mobilize finances to further support the businesses and improve productivity leading to improvement in the living standard of the people. Other forms of support for indigenous businesses in securing small loans could be explored and enhanced to encourage the continuous participation of the private sector in the management of the site.

For the effective management of the site, the "Collaborative management" (also referred to as co-management, participatory management, joint management, shared-management, multi-stakeholder management or round-table agreement) approach is highly recommended. This is the situation where some or all of the relevant stakeholders in the wetland are involved in a substantial way in management activities. The Wildlife

Division with jurisdiction over the wetland should develop a partnership with the other stakeholders which specifies and guarantees their respective functions, rights and responsibilities with regard to the wetland. In furtherance of this, the Site Management Committee (SMC) was established. The composition of the current SMC is as presented in Table 2 below.

Table 2. Songor Ramsar Site - Site Management Committee Members

Representative	Organisation
1. District Chief Executive	Dangme East District Assembly (DEDA)
2. Mrs. Victoria Baako	31 st December Womens Movement – Ada
3. Mr. G. T. Mortey	Ada Co-operative salt miners union
4. Mr. Akuamoah Yankey	Environmental Health Division – Ada
5. District Planning Officer	DEDA
6. District Forestry Officer	Forestry Services Division
7. Mr. M. K. Amegadzi	Town and Country Planning
8. Director of Agriculture	Ministry of Food and Agriculture (MOFA)
9. Ms. Emily Amerdjoe	Department of Community Development
10. Mr. Keni Agbakla	Assemblyman - Totope
11. Nene Okumo	Farmer / Traditional Leader – Obane
12. Mr. Bright Ahiagba	Farmer- Totimekope group
13. Amaki Ayika	Fish smoker - Anyakpor women's group
14. Godson Ashiamgmor	Lagoon fisherman / Assemblyman –Lolonya
15. Teye Laweh	Chief Fisherman- Anyakpor
16. Francis Gaweh	Farmer/ Assemblyman – Togbloku
17. Rebecca Terhperteygua	Fish fryer - Togbloku women's group
18. Rebecca Amenyedzi	Lolonya women's group
19. Isaac Djagbartey	Radio Ada – CNC
20. C. E. Bilson	Department of co-operatives - Kasseh

Much effort however, must be made to get away from Sector-Management and encourage division of responsibility for wetland resources among other institutions like: -

- Water Resources Institute
- Ministry of Agriculture (the Fisheries, Crops, Extension and Livestock Departments)
- Forestry Department
- Fire Service Department
- Ministry of Tourism (Tourist Board)
- Wildlife Department
- District Assemblies
- Department of Rural Development (Ministry of Rural and Local Government)
- The Universities and the Research Institutions. -
- Ministry of Education
- Ministry of Environment, Science & Tech. (EPA)

The sustainable use of the resources should be promoted by encouraging more the private sector, etc. on the SMC by restructuring the SMC and holding regular quarterly, meetings. It is essential to include the above stakeholders in the restructuring to broaden community participation and agreement on effective and wise use of the resources.

It is proposed that the following community groups be considered for membership of the restructured SMC.

- Women groups
- Chiefs - (owners of the land)
- Traditional Priest (who believe the gods live in the lagoon)
- Farmers / Herdsmen
- District Assembly / Unit Committee
- Churches
- Schools

- Fishermen / Fishmongers
- Herbalists
- Local Media
- Environmental NGOs
- Private Tourism Developers / Investors
- Salt Development Task Force & Artisanal Salt Winners.

4.2.3. Access, Education/Public Awareness

Public awareness and education can be promoted by:

- Encouraging Ghana Wildlife Society and other NGOs to organize as many environmental clubs and society members groups in schools and communities respectively with assistance from the Wildlife Division.
- The education centre mounting formal educational displays and holding classes.
- Organizing workshops, seminars and public forums in the communities on conservation issues by the Wildlife Division and other NGOs.
- Use posters, billboards, print and electronic media to highlight conservation messages by the Wildlife Division at all levels.
- The Wildlife Division should ensure that every institution whose activities impact on the wetland conservation be part of the educational workshops, seminars and public forum organized.
- Establishment of education Centre to give information to visitors, tourists, students, researchers, etc. Information at the Centre need to be updated regularly to assist analysis, etc. managed by the Wildlife Division and supported by the other institutions.
- the Ministry of Agriculture working with the Fire Service Department, organizing cattle grazers for education on indiscriminate bush burning and proper grazing practices to limit erosion.
- the Ministry of Agriculture to educate crop farmers within the site on the use of

manure to reduce chemical pollution of water by pesticides, insecticides and fertilizers

- Organizing and training Wildlife Task Force in communities along the beach, to protect and record data on nesting, hatchlings and dead turtles.

4.2.4. Research

In order to base management strategies on sound scientific database, a number of studies were initiated in various disciplines at the site under the CWMP. Local and foreign consultants undertook the studies but further research are recommended as follows:

4.2.4.1 Fisheries and Aquaculture studies.

- Fisheries economics of the lagoon
- Aquaculture potential of the Songor Lagoon with particular reference to the Volta clam *Galatea paradoxa* and black chin tilapia, *Sarotherodon melantheron*.

4.2.4.2 Aquatic ecology

- Aquatic productivity of the Songor lagoon
- Water quality studies

4.2.4.3 Ornithological studies

- Identification of nesting sites of birds and studies of their breeding ecology during the breeding season
- Clutch size determination of nesting birds and studies on strategies for protecting eggs against seasonal floods, trampling by cattle and humans
- Waterbird movements (Internal migration) through ringing

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- Investigation of molt patterns of key bird species (e.g. terns).
- Feeding ecology of piscivorous birds / waders.
- Waterbird ecology and wetland management
- Impact of lagoon fisheries on waterbirds populations

4.2.4.4 Marine turtle studies

- Determination of the status and distribution of marine turtles on the coast

4.2.4.5 Aquatic mammal studies (West African Manatee)

- There are reports of sightings of the West African Manatee *Trichechus senegalensis* in the Volta estuary. There is therefore the need to carry out a study into the distribution and threats to the conservation of the manatee.

4.2.4.6 Environmental impact assessment

- Environmental impact study of the salt industry in the wetland

4.2.5 Training needs

Presently there are only 3 staff for the whole of the Songor Ramsar site. Table 3 below - shows the staff strength of the site. The staff consists of 1 Assistant Wildlife Officer as the warden of the site, 1 Labourer and 1 driver.

Table 3. Staff Strength at Songor Ramsar Site

Name	Qualification	Years	Status
Dickson Agyeman	BSc. Natural Res. Mgt.	4	Asst. Wildlife Officer
Augustine Ire	GCE 'A' levels	2	Skilled labourer
Joseph Agbelorm	MSLC	3	Driver GD II

The site officers should be trained in community public relations, project management and implementation at GIMP A. Other post graduate level customized courses in wetland management can be useful to the officers. These will enhance their performance. The staff should be motivated by providing improved remuneration, adequate incentive, accommodation and working equipment.

The site is understaffed so it is recommended that more staff be recruited to assist with the management. At least 1 Ranger to assist the warden with the day to day running of the site and also in conservation education and three technical assistants to help with patrols and law enforcement.

The field staffs should be trained at Sunyani and Mweka in General Wildlife and Wetland courses to enhance their performance. The training will also help them to know more about wildlife conservation so that they could lead the crusade in the conservation of the wetland and Wildlife in general in the country.

Field staff should also go on attachment training in countries which are well advanced in wetland management e.g. the Netherlands and United Kingdom (RSPB reserves).

Turtle task Force members in the communities need to be trained in turtle data collection. Some members of the communities could be selected and given training to assist the wildlife staff in patrols and other duties.

4.2.6 "Estate" Management (Settlement & Infrastructure Development Accessibility)

- Under the CWMP the following structures *Education and information centre at Pute* and Research centre at Solikope near Ada Foah have been developed but are still at the foundation levels and there is therefore the need to complete them to serve the purposes for which they were intended.
- Construction of more bird watching towers and new hides in bird concentration areas to promote bird watching by the Wildlife Division and the Eco-tourism Companies.
- Provision of KVIP and boreholes in the communities by the District Assembly and the Volta Rural Water Supply and Sanitation Programme (VRWSS).
- Proper siting of kraals and pens for livestock by the Livestock Department of the Ministry of Agriculture to prevent destruction of breeding areas for the waterbirds. Also the destruction may lead to the area being colonized by different vegetation types.
- Due to the high salinity areas, salt collection areas inhibit vegetation growth. Thus it will be ecologically beneficial to properly site and erect salt collection areas and storage platforms around the communities by the SMC in collaboration with the Opinion Leaders and the Artisanal Salt Winners.

4.3 Projects and work programmes: proposed actions

The primary objective of the Songor site management plan is to protect and enhance ecological integrity of the wetland by restoring disturbed zones and promoting the sustainable use of the resource.

It is proposed that the specific actions of the Songor wetland management may include the following programmes.

4.3.1 Strategies for the development of the Songor wetland

The proposals for the conservation of the Songor wetland are based on the three general development programme for Ghana's wetlands.

Programme 1

This involves the creation of awareness on environmental issues among the local communities and the need to conserve and preserve wetlands;

Programme 2

This involves the rehabilitation of the resources and provision of infrastructure for sustainable management of the wetlands;

Programme 3:

This involves development progress for accelerated growth and development of wetland communities.

4.3.1.1 Environmental Education and Public Awareness

4.3.1.1.1 Expected output

- Adoption of wetland management policy into the overall national environmental

- protection policy endorsed by the government of Ghana
- Establishment of Public Education and Information Centre
 - Ensure that the District Assemblies factor in and enforce programme which are in line with the Ramsar Law.
 - Provision of bye-laws to regulate the uses of the wetland, prevention of pollution, degradation of the natural resources and support sanitation in the area

4.3.1.1.2

Activities

- Organization of workshops, seminars and public forums at communities on conservation issues by the Wildlife Division and NGOs to influence the attitudes of the communities on conservation of biodiversity
- Campaigns using posters, T-shirts, pamphlets and films and other teaching-aids in English and Dangme (the main dialect of the local communities) by the District Assemblies in collaboration with the Wildlife Division, Environmental Protection Agency (EP A);
- Use of the electronic media (local media) and the press for advertisement and relevant television programmes.
- Education on the dangers of bush burning and control of bush fires by Fire Service; and on cattle grazing by MOFA
- Formation of Community based Environmental Committees comprising of nominees by the District Assemblies.
- Training of local Environmental Committee members through collaboration with Fire Service, District Assemblies, Wildlife Division, MOF A (Agro-forestry Unit) and Ministry of Health.
- Establishment of a Wildlife Task Force to act as Monitoring, Control and Surveillance (MCS) unit in the communities along the beaches by the Wildlife Division and NGOs.
- Declaration of Wildlife Week to educate the public on wildlife conservation issues

4.3.1.1.3 Development target

- A trained Environmental Committee to be formed by the local communities by the end of year 1.
- A projected 90% of the people living within and around the Songor Ramsar site should be well-informed about practices that enhance conservation and restoration of the area by the end of year 1.
- Training of at least 20 people from the local communities in wetland management policies by WD, and MOFA by end of year 3.
- Enactment of legislation to regulate uses of the resources and prevent pollution and degradation of the resources by end of year 2.
- Established Wildlife Task Force by end of year 1

4.3.1.1.4 Important Assumptions

- The local communities are willing to collaborate in wetland management;
- The government of Ghana and the District Assemblies show strong and continuous commitment to the rehabilitation of wetlands in Ghana
- The government of Ghana is willing to legally gazette wetlands as "protected areas".

4.3.1.2 Rehabilitation and sustainable management

The Ramsar Law has been passed and so there is legal framework in support of conservation programmes. In order to sustain the project, arrangements have been made under the CWMP to continue ecological monitoring process with the Department of Zoology, University of Ghana; Water Research Institute and the Ghana Wildlife Society.

There is also the Community Investment Support Fund (CISF) to enable continued involvement of the communities. These measures are to ensure sustainability of the gains made under the CWMP.

4.3.1.2.1 Expected output

- Zoning and designation of the Songor wetland
- Restructured Site Management Committee to develop working/management plans for specific control over the use of the wetland
- Collaboration between institutions and stakeholders
- Incentive package for sustainable management of the wetland

4.3.1.2.2 Activities

- Conservation activities with respect to mangroves, manatee, turtles in general, birds including waterfowls by NGOs, Forestry Research Institute, Water Research Institute in collaboration with the Wildlife Division
- 300 acres mangrove re-generation in degraded mangrove areas to ensure conducive ecological environment for fish spawning, and to restore breeding/ roosting sites for cormorants at eastern side of the site by the end of year 4.
- Deliberate cultivation or tending of local species notably the Neem (*Azadirachta indica*) in and around settlements by local communities by the end of year 3.
- Cultivation of coconut palm around the settlements and on the beaches along the seashore to prevent erosion.
- A total of 100 acres woodlot development in elevated locations to meet fuel-wood, construction and other needs of the local communities by the end of year 4.
- Establishment of database on fishes, birds and other wildlife (e.g. lizards, royal python, marine turtles etc) leading to creation of a GIS package by the Remote

Sensing Applications Unit of the University of Ghana in collaboration with the Wildlife Division by end of year 2

- Fisheries, Water quality, bacteriological load and aquatic ecological monitoring by the Universities and Water Research Institute.
- Dredging and clearing of blocked creeks by Obane and Totimekope communities

4.3.1.2.3 Development target

The development target is to ensure that the Songor Ramsar site is designated as a fully protected wetland by the end of year 1.

4.3.1.3 Accelerated Growth, Eco-tourism and Infrastructural Development

The primary objective of this programme is to promote sectoral linkages through improvement and transformation of the local economy by improving social services and technical infrastructure, which will accelerate and sustain growth and Eco-tourism in the communities. This is anticipated to be achieved through three broad categories of development. These are (a) improvement of social needs (b) improvement of productive activities and (c) promotion of Eco-tourism

4.3.1.3.1 Improvement of Social Needs

Emphasis should be placed on

- Promotion of Family Planning Programmes;
- Improvement of sanitation along the coast as well as within the Songor wetland including proper siting and management of cattle kraals outside the settlements;

- Introduction of Primary Health Care activities;
- Provision of public places of convenience e.g. KVIP, water supply (boreholes and pipe water).
- Provision of refuse receptors to selected communities

4.3.1.3.2 Improvement of Productive Activities

The broad areas to concentrate on include:

- Support for provision of farming inputs in the form of credit, seeds, implements, storage, fertilizers and pesticides
- Promotion of small scale salt winning
- Erection of salt collection areas and storage platform around communities

4.3.1.3.3 Promotion of Eco-tourism

The potential for Eco-tourism in the Songor Ramsar site has been documented with respect to watching and studying the flora, aquatic and terrestrial fauna (Ntiamoa-Baidu & Gordon, 1991; Agyepong et al., 1993; Carr & Campbell, 1995; Toth & Toth, 1974).

The priorities include:

- Completion of Education Information and Research Centres commenced under the CWMP to provide information on the site.
- Promotion of festivals and other tourist attractions e.g. the Yomo shrine near Lufenya and improvement of road network to the town.
- Creation of breeding sanctuaries for waterfowls and marine turtles

4.3.2 Ornithological Programme

4.3.2.1 Research into Breeding Activities of Birds

These include identification of nesting sites of birds, recording of clutch sizes of eggs, number hatched, etc. so as to protect them from seasonal floods, trampling by cattle and humans.

4.3.2.1.1 Bird Ringing Activities

This helps to provide information on the distribution and movement of bird

4.3.2.1.2 Personnel

NGOs working in collaboration with the Wildlife Division. The NGOs especially the GWS has the expertise in ringing and therefore will be beneficial to the staff of the Division to work with those from GWS to acquire the knowledge.

4.3.3. Aquaculture Programme

4.3.3.1 Aquaculture of the Black Chin Tilapia and the Volta Clam

There is potential for Aquaculture development in ponds of fresh and brackish water especially east of the lagoon. The species to be considered initially is the Black Chin Tilapia, *Sarotherodon melanotheron*. The sedge salt marshes below the 9.1m contour in the neighbourhood of Lufenya, Tobloku, Wasakuse (Ngwa) and Obane are possible locations through adoption of existing ponds or direct construction of fish ponds.

Support for small scale Aquaculture may involve the establishment of fish hatcheries to

produce fingerlings. In addition the biology, fishery and Aquaculture potential of the Volta clam, *Galatea paradoxa* (formerly *Egeria radiata*) can be investigated.

4.3.3.2 Personnel

Water Research Institute in the Council for Scientific and Industrial Research (CSIR).

4.3.4 Marine Turtle Programme

Survey of the Marine Turtle species to establish the diversity and abundance along the beaches and implement measures for the effective conservation of the species. There will be patrols on the beaches to enforce law on turtle exploitation by the Turtle Task Force members.

4.3.4.1 Personnel

NGOs in conjunction with the Wildlife Division staff.

4.3.5 Afforestation and Agro-Forestry Programme

- Mangrove re-generation in the degraded mangrove areas should be undertaken to ensure conducive ecological environment for fish spawning, and to restore breeding/roosting sites for cormorants at eastern side of the site.
- Deliberate cultivation or tending of local species notably the Neem (*Azadirachta indica*) in and around settlements by local communities.
- Introduction of other species e.g. *Khaya senegalensis* (Dry-zone Mahogany) and *Anogeissus leicocapus*. The *Khaya senegalensis* has been introduced into some parts of the area. In localities such as Lolonya and Adokope the trees have been observed to be in excellent condition.
- Promotion of the cultivation of tree crops such as mangoes, oil palm and cashew.

- Cultivation of coconut palm around the settlements and on the beaches along the seashore.
- Woodlot development in elevated locations above the critical contour of 9.1m a.s.l. to meet the fuel-wood, construction and other needs of the local communities.

4.3.5.1 Personnel

The Forestry Department, Forestry Research Institute of Ghana (CSIR), Agro-Forestry Department (Ministry of Agriculture), the Communities and the Wildlife Division.

4.3.6 Public Education Programme

- Organization of workshops, seminars and public forums at communities on conservation issues by Wildlife Division and NGOs to help change the attitudes of the communities towards biodiversity conservation.
- Campaign for the enforcement of sanitation along the coast as well as within the entire wetland environment.
- Stepping up of conservation education and public awareness programmes within the local communities.
- Education on bush burning and fires control by Fire Service; and on cattle grazing by MOFA.
- Establishment of Public Information Centre

4.3.6.1 Personnel

The Wildlife Department, NGOs, Fire Service Department, Ministry of Agriculture, Ministry of Education, District Assembly and the Media.

4.3.7. Eco-tourism and Biodiversity Conservation Programme

The potentials for Eco-tourism, Research and Conservation in the Songor Ramsar site have been documented with respect to watching and studying the flora, aquatic and terrestrial fauna (Ntiamao-Baidu and Gordon, 1991; Agyepong et al., 1993; Carr and Campbell, 1995; Toth and Toth, 1974). Conservation activities with respect to these are needed to be fully explored:

Flora:	Mangroves
Aquatic Fauna:	Marine Turtles
Terrestrial Fauna:	Birds including waterfowls
Sacred Places:	Yomo shrine, near Lufenya No.1
Beaches:	Sandy beaches flanked with coconut trees
Economic activities:	Salt industry and Fishing

- Beach front development including citing of hotels and guest houses e.g. the Goi Hotel Complex (under construction); provision of facilities for boat cruising on lagoon and the sea/ocean.
- Creation of bird sanctuaries, observation and roosting sites.
- Provision of suitable infrastructural facilities such as public places of convenience e.g. KVIP, water supply (Boreholes and pipe water).
- Promotion of festivals and other tourist attractions e.g. sacred places.
- Maintenance of refuse skips in refuse burden communities by the District Assembly and Community Leaders to reduce spill over into the lagoon and water channels.
- Maintenance of the 30% area used for salt winning through joint effort of communities and salt industry to restrict expansion into the other ecological areas by SMC.

4.3.7.1 Personnel

The SMC, District Assembly, Wildlife Department, Volta Rural Water Supply and

Sanitation Project, Tourist Board, Traditional Authorities, Salt Development Task Force & Artisanal Salt Winners and the Private Tourist Developers.

4.3.8 Hydrological Improvement Programme

- Dredging and clearing of the blocked 22km creeks/channels by the Communities within the eastern section of the Songor to be organized by the Wildlife Department.
- The possibility of installing sluice gates on access channels at Big Ada (Luhue) and Ada-Foah (Futue) should be explored.

4.3.8.1 Personnel

The Community Leaders; the Wildlife Division, the Volta River Authority, and the Ministry of Works and Housing (AESL).

4.4. MONITORING AND REVIEW

The Wildlife Division will be expected to monitor and ensure a major review of all programmes at least within five years. There should be annual review as well as a major review at the end of year two and four respectively.

4.4.1 Biological Monitoring

The Wildlife Division will be expected to co-ordinate the following programmes:

- Monitoring water quality and level by the Water Research Institute after installation of water gauge at suitable locations.
- Aquatic ecological monitoring by the Universities and Water Research Institute.
- Review and analysis of data on birds, turtles, and fisheries to understand trends and

changes in abundance at the site by the NGOs and Research Institutions (WRI).

- Establishment of database on fishes, birds and other wildlife (e.g. lizards, royal pythons, marine turtles etc.) leading to the creation of a GIS package by the Remote Sensing Applications Unit, of the University of Ghana in collaboration with the Wildlife Division.
- Establishment of a Wildlife Task Force to act as Monitoring, Control and Surveillance (MCS) unit in the communities along the beaches by the Wildlife Division and NGOs.
- Bacteriological load in the water to monitor levels of pollution.
- Monitoring of fish species diversity and exploitation levels to be undertaken by the WRI.

4.4.2. Socio-Economic Monitoring

- Monitoring demographic changes by the Planning Office of the District Assembly and the Institute for Statistics and Socio-Economic Research (ISSER).
- Impact Assessment by the NGOs and the District Assembly.
- Relationship between the SMC, the Communities and the participating institutions by the NGOs.

4.4.3 Policy Monitoring

- The SMC must go on inspection tours at least bi-annually to ensure compliance to their policies.
- The Wildlife Division should review annually the District Assembly's co-operation with the SMC.

4.5. Additional Information

Successful implementation of the Management Plan depends to a large extent on the level of collaboration between the institutions and stakeholders. For this reason, it is anticipated that the Wildlife Division is to take up the co-ordinating role and ensure avoidance of duplication. The Wildlife Division should collaborate, through Memorandum of Understanding with the relevant institutions for execution of sub-components of the work programmes. The Wildlife Division must liaise with the District Assembly, Traditional Authorities and Associations of fishermen, salt winners and farmers.

It is also proposed that private sector participation and investment will mobilize finances to further support the management objectives and improve productivity leading to raising living standards of the communities.

There is the urgent need for more resource allocation into education and awareness. This is reflected in the budget estimates for the area. The education must be combined with training. Women should be involved at every stage of management since they influence the wetland ecology.

The Wildlife Division, acting as the Coordinating Agency, must however avoid to be seen as dominating or perceiving as impinging upon the mandate of other sector ministries. The Wildlife Division must work harder to bring the widest possible range of institutions concerned with wildlife management together.

The other important audience to be educated is the group of political and administrative decision-makers who guide national policies on the use of wetlands. Government, bilateral and multilateral development assistance groups whose investment direction in a way control the fate of thousands of hectares of wetlands. This should be the responsibility of the Parliamentary Select Committee on Environment and the Media.

Often resources allocated for education and awareness creation are inadequate but education forms one of the major activities needed to be carried out in wetland protection and conservation. There is the need therefore for more resources to be channeled into education and awareness creation.

Funds will be required to implement the Management Plan and it is anticipated that the Wildlife Division will solicit for assistance from donors.

In addition, the issue of clamoring for benefits from the salt production at the detriment of the wetland should be resolved among the local authorities and other stakeholders. There is a conflict of interest arising from the Government's eagerness to increase revenue from the sale of salt produced in the area and living up to the dictates of the International Convention it signed to conserve the wetland. These fundamental issues have to be resolved to enable the Management Plan to be effective.

4.6. COST IMPLICATIONS OF MANAGEMENT STRATEGIES (BUDGET)

The following table provides a breakdown of the cost implications of the management plan over a maximum five-year period:

Table. 4 Estimated Budgets for the Management Strategies

Activity/Inputs	Duration	Estimated Budget (Cedis)
Mangrove restoration (300 acres) <ul style="list-style-type: none"> • 400,000 seedlings • polythene bags • water • cutlasses, pick-axes, hoes • miscellaneous items 	5 years	90,000,000
Infrastructure completion <ul style="list-style-type: none"> • Completion of work on Education • Information Centre at Pute 	4 years	550,000,000

<ul style="list-style-type: none"> • Completion of work on Research Centre at Solikope near Ada-Foah • Installation of water gauge are suitable locations 	4 years	550,000,000
<p>Eco-tourism and biodiversity conservation</p> <ul style="list-style-type: none"> • Creation of 3 breeding sanctuaries for water fowls; 2 for marine turtles • Patrols to prevent encroachment/restrict access to roosting/breeding areas • Workshops to encourage private sector investment in Eco-tourism • Development of 3 management zones within site • Promotion of festivals and other tourist attractions • Restoration/preservation of Yomo shrine near Lufenya and improvement of road to the town 	5 years	160,000,000'
<p>Woodlots establishment (100 acres)</p> <ul style="list-style-type: none"> • land preparation • 100,000 seedlings • miscellaneous 	5 years	30,000,000
<p>Habitat improvement</p> <ul style="list-style-type: none"> • Provision of 15 refuse receptors to selected communities • Dredging and clearing of blocked creeks by Obane and Totimekope communities food for community • shovels and cutlasses • introduction of agro-forestry practices in the farmlands -, • Erection of salt collection areas and storage • platform around communities 	3 years	105,000,000
<p>Public education/ awareness creation.</p> <ul style="list-style-type: none"> • Equipment of Education Information Centre • Equipment of Research Centre • Engagement of local media • workshop and campaign on environmental sanitation and public fora on conservation 	5 years	50,000,000
<p>Research</p> <ul style="list-style-type: none"> • field and laboratory studies 	3 years	

<ul style="list-style-type: none"> • hiring of labour • travel and transport • per diem to researchers • report writing • stationary/ communication . 		
Monitoring and review <ul style="list-style-type: none"> • annual project review • major project review (bi-annually) • monitoring of fisheries, aquatic ecology, bacteriological load • establishment of Wildlife Task Force restructuring of SMC • travel and transport stationary/ communication • sitting allowance and per diem for SMC report writing • monitoring of demographic changes by DAs • and ISSER (UG, Legon) 	5 years	120,000,000
Training <ul style="list-style-type: none"> • 4 field staff training in general wildlife & wetland at Mweka and Sunyani • 2 Senior staff training in community public relations and implementation at GIMPA • Training of Marine turtle task force in turtle data collection • Conferences and Seminars • Attachment training for WD Field Staff 	2 years	40,000,000
TOTAL		985,000,000

4.7 LIST OF MATERIAL NEEDS

All eight work programmes will require specific material needs, however, the fundamental materials needed at the Wildlife Department's offices for the smooth running of the Management Plan are as follows:

- Means of Transport (land and water) - for research, monitoring and possible

extension work

- Experimental Fishing Gear (cast nets of appropriate mesh sizes, drag nets
- Office Equipment (photocopier, printer etc.)
- Computers with Microsoft Word, Microsoft ACCESS, Microsoft EXCEL and FISAT Software
- Refrigerator/ Deep Freezer
- Measuring Boards
- Generators
- Cast Nets (3 varied mesh sizes)
- Local Drag Nets (multi-filament)
- Hand Lenses
- Folding Tables(metal with leather top)
- Folding Chairs (metal with leather seat)
- Summer Hut (Waterproof)
- Rain Coats
- Economic Plastic Calipers
- Fish Containers/ Ice Chests
- Dissection Kits
- Pocket Calculators
- Plastic Ware
- Camera
- Pair Binoculars
- Microscopes
- Headlamps for Microscope
- Wellington Boots
- Books, Magazines and Journals on the relevant subject areas

4.8. TIME TABLE FOR IMPLEMENTATION

4.8.1. Objectives Implementation

Table 5. Objectives Implementation Schedule

ACTIVITIES	YEARS				
	1	2	3	4	5
1. CREATE OF PROTECTED AREAS FOR BREEDING	■	■	■	■	■
2. IMPLEMENT ALL NATIONAL WETLAND POLICIES AND DISTRICT BYLAWS	■	■	■	■	■
3. NGOs TO BUILD PUBLIC SUPPORT AND AWARENESS	■	■	■	■	■
4. INVOLVE MEDIA IN PUBLIC EDUCATION	■	■	■	■	■
5. ESTABLISH AN INFORMATION CENTRE	■	■	■	■	■
6. ENCOURAGE FISHERIES AND AQUACULTURE MANAGEMENT PRACTICES	■	■	■	■	■
7. RESTRUCTURE MEMBERSHIP OF THE SMC	■	■	■	■	■
8. CREATE EFFECTIVE WORKING ENVIRONMENT FOR COLLABORATION WITH OTHER INSTITUTIONS			■		
9. ENCOURAGE PRIVATE SECTOR PARTICIPATION IN THE SMC		■	■	■	
10. INTRODUCE PRIVATE SECTOR INVESTMENT INTO ECO-TOURISM, SALT INDUSTRY, ETC.		■	■	■	
11. DEVELOP A TOWN/DISTRICT DEVELOPMENT PLAN	■	■	■	■	■
12. BUILD CAPACITY OF ALL STAFF OF IMPLEMENTING INSTITUTIONS				■	

4.8.2. Projects and Work Programmes Implementation

A five-year work plan is provided as follows:

Table 6. Projects and Work Programmes Implementation Schedule

ACTIVITIES	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
1. Preliminary and other organizational work Wildlife Department					
2. Restructuring of SMC					
3. SMC Meetings					
4. Habitat/species management					
5. Public awareness/ education					
6. "Estate" management- (settlement & infrastructural development					
7. Ornithology programme					
8. Aquaculture programme					
9. Marine turtle programme					
10. Afforestation & Agro-Forestry Programme					
11. Beach front development					
12. Creation of protected areas for breeding waterfowls/marine turtles/fishes etc					
13. Organization and training of Wildlife Task Force					
14. Capacity building of staff of institutions involved in conservation					
15. Establishment Information Centre					
16. Erection of bird sanctuaries					
17. Provision of KIPs and water supply					
18. Promotion of Eco-tourism					
19. Agriculture development programme					
20. Socio-economic monitoring					

21. Biological monitoring			
22. Policy monitoring			
23. Dredging and clearing of blocked 22km creeks/channels			
24. Training of site officers in community public education/project management and implementation at GIMPA/Masters degree level			

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6.0. APPENDICES

APPENDIX 1. - LIST OF RESOURCE PERSONS

Dr. P.K. Ofori-Danson - Leader

Mr. George Ahadzie

Miss. Brigitte A. Kpodar

Mr. Frederick Adu Dankwa

Mr. Joseph S. Amakye

Mr. Samuel Kofi Nyame

Traditional Authorities

Wildlife Staff

APPENDIX 2. - SPECIES LISTS OF THE SONGOR RAMSAR SITE

Common Macro-Invertebrates (Source: Piersma & Ntiamoa-Baidu, 1995)

Annelida

Polychaetes (possibly **Dipsio africana**)

Polychaetes (possibly *Glycera convulata*)

Oligochaetes

Crustacea

Amphipods (possibly *Urothoe grimaudi*)

Parapenaeopsis atlantica

Penaeus notialis

Callinectes amnicola

Cardiosoma armatum

Ocypode africana

Sersama huzardi

Mollusca

Gastropoda

Hydrobia accrensis

Tympanotonus fuscatus

Bolinus cornutus

Neritina adansoniana

Mollusca (continued)

Bivalvia

Congeria ornata

Corbula trigona

Tellina.nymphalis

Gastrana multangula

Loripes aberrans

Melanoides tuberculata

Fishes (Source: Ofori-Danson *et al.*, 1999)

Cichlidae

Sarotherodon melanotheron

Tilapia guineensis

Tilapia zillii

Gobiidae

Porogobius schlegelii

Clupeidae

Sardinella maderensis

Pellonula leonensis

Carangidae

Caranx hippos

Amphibians

Bufo regularis

Black-tailed Godwit	- <i>Limosa limosa</i>	3
Bar-tailed Godwit	- <i>Limosa lapponica</i>	3
Curlew	- <i>Numenius arquata</i>	3
Knot	- <i>Calidris canotus</i>	3
Sanderling	- <i>Calidris alba</i>	3
Little Stint	- <i>Calidris minuta</i>	3
Curlew Sandpiper	- <i>Calidris ferruginea</i>	3
Marsh Sandpiper	- <i>Tringa stagnatilis</i>	4
Green Shank	- <i>Tringa nebularia</i>	4
Spotted Red Shank	- <i>Tringa erythropus</i>	4
Black-winged Stilt	- <i>Himantopus himantopus</i>	4
Avocet	- <i>Recurvirosta avosetta</i>	4
Little Egret	- <i>Egretta garzetta</i>	5
Reef Heron	- <i>Egretta gularis</i>	5
Great White Egret	- <i>Egretta alba</i>	5
Grey Heron	- <i>Ardea cinera</i>	5
White Pelican	- <i>Pelicanus onochrotanus</i>	6
Little Tern	- <i>Sterna albifrons</i>	7
Common Tern	- <i>Sterna hirundo</i>	7
Roseate Tern	- <i>Sterna dougallii</i>	7
Sandwich Tern	- <i>Sterna sandvicensis</i>	7
Royal Tern	- <i>Sterna maxima</i>	7
Caspian Tern	- <i>Sterna caspia</i>	7
Whiskered Tern	- <i>Sterna hybrida</i>	7
Black Tern	- <i>Chlidonias niger</i>	7

Mammals

West African manatee - *Trichechus senegalensis*