



**DISTRICT ENVIRONMENT ACTION PLAN (DEAP)
BONDO DISTRICT**

2006-2011

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CHAPTER 1: INTRODUCTION

1.1 Background

The United Nations Conference on Environment and Development (UNCED) required all countries world wide to domesticate Agenda 21. Agenda 21 stands as a comprehensive blue print for action to be taken globally by governments, United Nations organizations, development agencies, non-governmental organizations (NGOs) and independent sector groups in every area in which human activity impacts on the environment. Kenya, as one of the 178 countries that adopted the Agenda 21, domesticated the same through the formulation of the first National Environment Action Plan (NEAP) in 1994. NEAP proposed the enactment of a framework environmental law, which led to the creation of Environmental Management and Coordination Act of 1999 (EMCA). EMCA led to the creation of a number of institutions charged with the overall mandate of ensuring and promoting environmental conservation in Kenya, among them being National Environment Management Authority (NEMA).

1.2 Challenges of Sustainable Development

Sustainable development as has always been defined to mean development that meets the needs of the present without compromising the ability of the future generation to meet their needs. This embraces social, economic and environmental growth and stability. Sustainable development per se has not been realized in Bondo and Kenya at large.

Agriculture and fishing form the key sources of livelihoods in Bondo and both can only efficient with conservation and management of environment and its natural resources. Though this has not been the true case, rather high dependency and poor use of these resources have led to their degradation. Most people employ bad farming and fishing practices that have led to the degradation of the environment and the supporting natural resources. The improper use of pesticides, poor cultivation, continuous logging, and use of illegal fishing gears and pollution of the lake are some of the threats to our environment the district.

Poverty leads to over use and destruction of the environment where short term development and economic goals and practices are pursued at the expense of long term environmental sustainability. Once the resource base is degraded, poverty is aggravated because the capacity of the resource base to support the same population even with unchanged demand will have diminished. Approximately 47.2% of the population is poor and 41.1% of households live below the poverty line (Source: Bondo District PRSP, Consultation Report for 2001-2004) and the Ministry of Planning and National Development latest figures give Bondo as the second poorest district in Kenya. This is a major challenge in attaining sustainable development as the poor will continuously exploit the resources to derive livelihoods.

Bondo is fairly a new district and population is increasing due to births, government employees deployed in the district, new Civil Society Organizations working in the district and also the expanding fishing industry in the district. Although there is some rural-urban

migration, increasing development and economic activities in the district has resulted in more people coming in than going out. For instance, in Maranda division, the population density by 1999 was 192 while in 2005 the density is 247 indicating an increment of 28.64% within a span of 6 years. Thus increase in population density has put a lot of pressure on the environment and natural resources as people clear forests, drain wetlands e.t.c for settlement and agriculture.

Environment was managed by the sectoral laws which had conflicts of interest and were unsuccessful until the government enacted the framework law, EMCA in 1999 to regulate the use of environment and its natural resources. Enforcement and compliance still remain challenges due to inadequate stakeholder involvement, resource limitations and non-integration of environmental concerns into development plans in the district.

1.3 Provisions of EMCA on Environmental Planning

Part IV of EMCA establishes National Environment Action Plan Committee that shall, every five years, prepare a national environment action plan for consideration and adoption by the National Assembly. The Act provides further that the District Environment Committee shall, every five years, prepare a district environment action plan in respect of the district for which it is appointed and shall submit such plan to the chairman of the Provincial Environment Action Plan Committee for incorporation into the Provincial Environment Action Plan (PEAP) that will be incorporated into the NEAP.

1.4 Objectives of District Environment Action Plan (DEAP)

- a) To determine the major environmental challenges and issues facing Bondo district
- b) To identify environmental management opportunities
- c) To create synergy and harmony in environmental planning
- d) To integrate environmental concerns into social, economic planning and development
- e) To formulate appropriate environmental management strategies.

1.5 Linkages with other Processes

The State of Environment Report for Bondo district is an annual production with the aim of informing the Kenyan government and the general public on the degradation of the environment as well any conservation or management measures achieved. It further highlights areas for intervention, where the government and the public should take charge. The District Environment Action Plan therefore identifies areas of action or implementation within five years to address such environmental concerns geared towards sustainable development. The DEAP for Bondo runs from 2006-2011.

The DEAP also aspires to address similar issues on development just like District Development Plan (DDP) and other policy papers such as Poverty Reduction Strategy Paper (PRSP) and Economic Recovery Strategy for Wealth and Employment Creation (ERSWEC)

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The eight Millennium Development Goals (MDGs) all aim at achieving sustainable development. There is no need to overemphasize that the backbone of development lies on the conservation and management of environment and natural resources. Goal number 1 aims at eradicating extreme poverty and hunger while goal number 7 aims at ensuring environmental sustainability. The relationship between poverty and environmental degradation cannot be gainsaid. Poor people continuously utilize the scarce resources leading to overexploitation and thus lead to degradation of the environment.

Agenda 21 which is the Rio Declaration on Environment and Development is working towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system. Principle 4 states that in order to achieve sustainable development, environmental protection shall constitute an integral part of development process and cannot be considered in isolation from it while one of the objectives of the DEAP which will lead to production of NEAP is to integrate environmental concerns into social, economic planning and development. Both Agenda 21 and the DEAP are recognizing that sustainable development only occurs when issues of planning and development are integrated and go hand in hand.

Multilateral Environmental Agreements (MEAs) are agreements between states which may take the form of soft-law, setting out non-legally binding principles which parties will respect when considering actions which affect a particular environmental issue or hard-law which specify legally-binding actions to be taken to work toward an environmental objective.

Kenya is has domesticated a number of MEAs among them are Convention on Climate Change; Convention on Biological Diversity (CBD); The Forest Principles; The Rio Declaration on Environment and Development; describes states' obligations for promoting the principle of sustainable development. This principle involves managing resources in a way that provides for our needs in using those resources, as well as providing for their protection – both for their inherent value, and to preserve mankind's future interests in them. The MEAs are laying emphasis on sustainable development and DEAP also identifies integration of environmental concerns into social, economic planning and development.

CHAPTER 2: DISTRICT PROFILE

2.1 Geographical Location, Size & Administrative Units

Bondo district lies between 0° 26° to 0° 90° and from longitude 33° 58° E and 34° 35° W. The district was carved out of Siaya in May 1998. It borders Siaya district to the North, Kisumu district to the East and Homa Bay and Suba across the Winam Gulf to the South East and South. To the West is Uganda. The district covers a total of 1,972km² out of which 972km² is land mass while the rest 1,000km² is water surface.

Topographically, the district is divided into scattered highlands such as Got Ramogi and Usenge in Usigu division, Got Abiero and Sirafuongo in Nyang'oma division, lowlands of Yala Swamp and Uyoma Plains. These result into differences in relief, soils and land use. These features give rise to altitudes ranging between 1140m and 1400m above the sea level. The oldest exposed volcanic rocks such as basalt, elite and rhyolite cover the district geologically. Others include intrusives of post Nyanzanian/preKavironian age. In Uyoma Peninsula are found tertiary volcanoes consisting of the nepheline lava agglomerates.

Administratively, the district is divided into five divisions namely Maranda, Nyang'oma, Rarieda, Madiany and Usigu (See map below), each headed by a district officer. The district has a total of nineteen locations and forty-nine sub-locations. Nyang'oma has two locations and seven sub-locations, while Maranda, Madiany and Rarieda have four locations each. However, there are thirteen sub-locations in Madiany, ten in Maranda respectively. Usigu leads with five locations but only ten sub-locations.

2.2 Climate & Physical Features

The district has a modified equatorial climate with strong influence from local relief and the expansive lake, which influence rainfall amounts and distribution. Predominantly, the district has warm, dry and humid climate with mean annual rainfall ranging between 800-1600 mm on bi-modal rainfall pattern of long rains occurring between March and May and short rains occurring between October and November.

Temperatures too vary with mean of 22.5°C and evaporation varies between 2000 mm and 2200 mm annually.

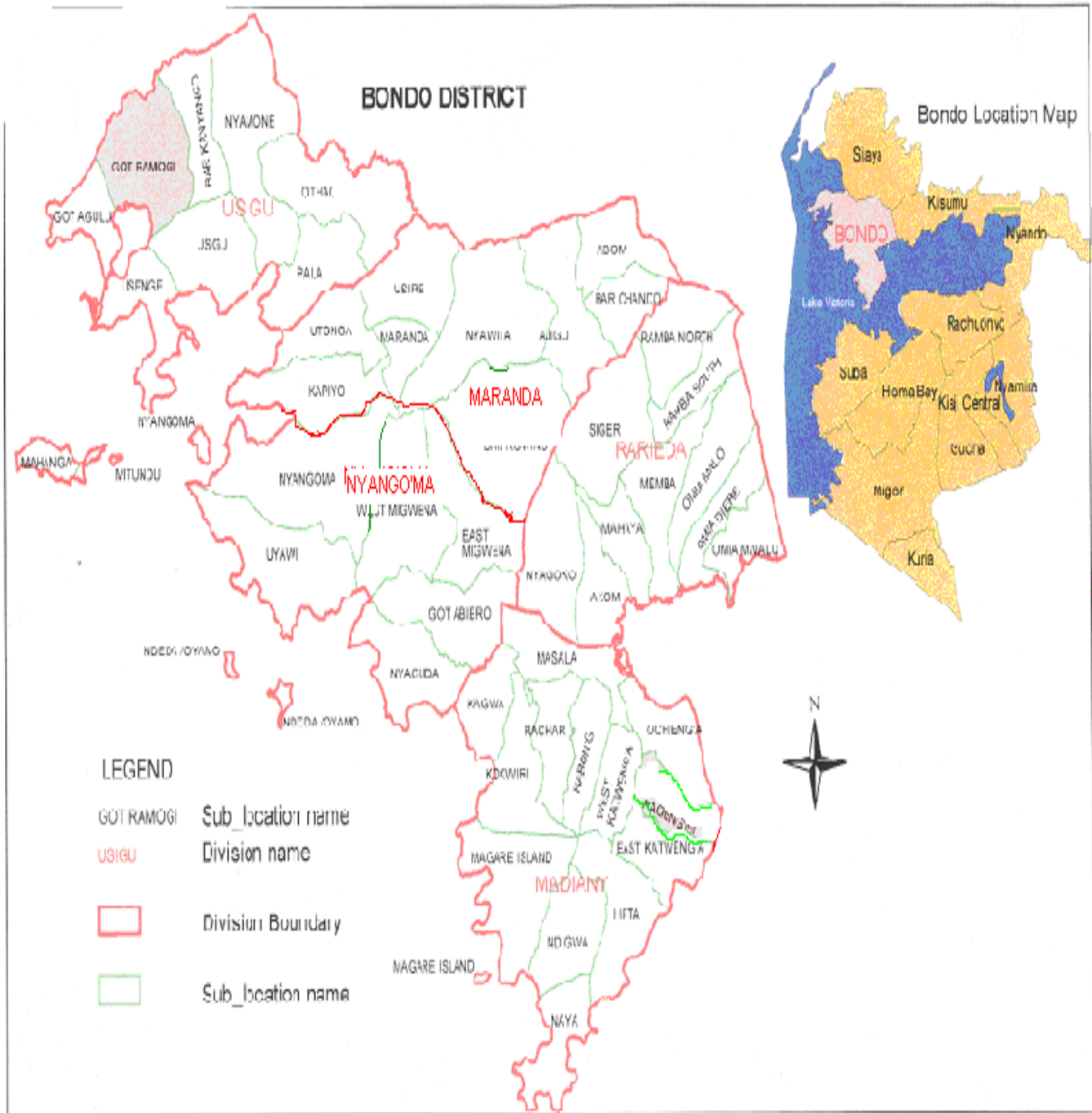
2.2.1 Soils of Bondo

From the geological coverage, the soil types found range between black-cotton, sandy loams and laterites including red volcanic soils in the north.

The district has various soil types as highlighted below;

- West Sakwa, South Nyang'oma and Usigu division have **ferralsols**
- North Sakwa, East and Central Yimbo have **luvisols** with low-moderate fertility
- Yala Swamp in Usigu division has **gleysols**, which are water logging, fertile and variable

Figure 1: Bondo District Map



- Madiany division has fertile and moderately deep *Phaeozeous* soils
- Nyandiwa valley in South Asembo has valley soils of low fertility.

2.2.2 Land Cover

The district has a total area of 1,972 km² out of which 972 km² is landmass while the rest 1,000 km² is water surface. The total arable land is 797²km.

Table 2 (a) Size, status and use of forest reserves in Bondo.

Hilltop	Area (ha)	Status	Use
Got Abiero	62	Trust land	Grazing, grass, firewood
Got Usenge	83	Trust land	Grazing, grass, firewood
Got Ramogi	283	Forest reserve	Partly intact natural forest; partly exotic trees planted by KEFRI Cultural attachment, herbal medicine
Rambungu Hills	5.4	Trust land	Grazing, grass, firewood
Sirafuongo	10	Trust land	Grazing, grass, firewood

Source: District Forest Office, Bondo, 2006

2.3 Population and Distribution

There has been a steady increase in population over the years. Densities are high in urban centres, shopping centres and beaches where there are considerable economic activities and better infrastructural development. The District Development Plan cites Rarieda as one of the five divisions in Bondo with the highest population density estimated at 319 persons/km² while Nyang'oma has the lowest population density estimated at 186 persons/km².

2.4 Social, Cultural and Economic Characteristics

Main economic activities in the District include:

1. **Agricultural activities:** agriculture contributes 79% to the household incomes. As a result of massive unemployment experienced, particularly among the energetic youth, many people are turning to farming as a way of livelihood. In some case, this has led to more forests being cleared for farming.
The vast land in the District has a high potential of livestock production. Unchecked keeping of livestock has resulted to overgrazing which has increased the loss of soil cover, through soil erosion.
2. **Fishing:** the District is endowed with an estimate of 1000 km² of water mass making fishing to be one of the major economic activities in the District. However it's imperative to note that Over-fishing in breeding grounds in bays along the lakeshore and trawler fishing has negatively impacted on sustainable exploitation in the industry.

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3. Mining and quarrying is also generating income in number of households. This venture is however unregulated and in most cases results to land degradation.

Poverty levels:

Bondo is one of the poorest districts in the country with poverty levels being as high as 70.6%. The most affected group is the women whose ratio compared to the male is as high as 100:100. Also another group which is affected is the youth, whose percentage stands at 20.4 % of the total population. With such a high number of youth competing for the limited employment opportunities, many youth engage in income generating activities which are not environmentally friendly.

Geographically, population distribution statistics shows that poverty levels are higher in rural areas (70.6%) compared to the urban centers (67.5%). This is mainly attributed to the availability of formal employment opportunities in urban centers compared to unprofitable farming which is the major economic activity in rural areas. Faced with unreliable farming, many people in rural areas look for other ways of earning living. These include selling firewood, charcoal, quarrying and mining which leads to environmental degradation.

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Table 2 (b) Population size and distribution (density)																	
DIVISION	LOCATION	1999		2001		2002		2003		2004		2005		2006		2011	
		NO.	Density	NO.	Density	NO.	Density	NO.	Density	NO.	Density	NO.	Density	NO.	Density	NO.	Density
MARANDA	Bondo Township	2920 2	278	3026 6	288	3081 3	293	3136 9	299	3193 5	304	3251 3	309	3310 0	315	3619 9	345
	North Sakwa	7695	265	7975	275	8120	280	8266	285	8415	290	8566	295	872	300	9537	329
	South West Sakwa	4061	104	4209	108	4285	110	4363	112	4441	114	4520	116	4603	118	5033	129
	West Sakwa	4083	128	4232	132	4309	135	4386	137	4465	140	4545	142	4628	145	5061	158
	MARANDA	4504 1	192	4668 2	228	4752 7	232	4838 4	236	4925 6	240	5014 4	247	5106 2	249	5583 0	272
	NYANGOMA	Central Sakwa	2118 5	183	2195 7	189	2235 4	193	2275 7	196	2316 9	200	2358 6	203	2501 2	216	2735 3
South Sakwa		1360 7	189	1410 3	196	1435 8	199	1461 7	203	1488 1	207	1514 9	210	1542 4	214	1686 7	254
NYANGOMA		3479 2	185	3606 0	191	3671 2	195	3737 4	198	3805 0	202	3873 5	206	4043 6	215	4422 0	235
MADIANY	Central Uyoma	1130 1	249	1171 3	258	1192 5	263	1214 0	267	1236 0	272	1258 1	277	1280 9	282	1400 7	309
	East Uyoma	1246 7	225	1292 1	234	1315 5	238	1339 2	242	1363 4	247	1387 9	251	1413 2	256	1545 4	279
	South Uyoma	1795 9	317	1861 4	329	1895 0	335	1929 2	341	1964 0	347	1999 4	353	2035 7	360	2226 2	393
	West Uyoma	1705 7	267	1767 9	277	1799 8	282	1831 7	287	1865 3	292	1899 0	297	1932 2	302	2113 0	331
	Madiany	5878 4	266	6092 7	275	6202 8	280	6314 1	285	6428 7	291	6544 4	296	6662 0	301	7285 3	329

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RARIE DA	Central Asembo	1895 3	319	1964 4	371	1999 8	377	2036 0	384	2072 7	391	2110 1	39 8	2148 3	405	2349 3	443
	East Asembo	1619 0	355	1678 0	368	1708 3	375	1739 2	381	1770 5	388	1802 6	39 5	1835 2	402	2006 9	440
	South Asembo	9380	238	9722	247	9897	251	1007 6	256	1025 7	260	1044 3	26 5	1063 1	270	1162 6	295
	West Asembo	1236 0	306	1281 0	317	1304 2	323	1327 8	329	1351 7	335	1376 1	34 1	1401 0	347	1532 1	379
	RARIED A	5688 3	319	5895 6	330	6002 0	336	6110 6	343	6220 6	349	6333 1	35 5	6447 6	361	7050 9	395
USIGU	Central Yimbo	7071	135	7328	140	7461	142	7596	145	7733	148	7873	15 0	8014	153	8783	168
	East Yimbo	7097	139	7355	144	7488	146	7623	149	7762	152	7902	15 4	8044	157	8796	172
	Mageta Island	4242	695	4397	721	4476	734	4557	747	4640	761	4723	77 4	4808	788	5258	861
	North Yimbo	7177	131	7439	136	7573	139	7710	141	7849	139	7990	14 6	8135	149	8896	163
	West Yimbo	1769 3	592	1833 8	613	1866 9	624	190 06	635	1935 0	647	1969 8	65 9	2005 4	670	2193 1	733
	USIGU	4328 0	223	4485 7	231	4566 7	235	4649 2	239	4733 4	244	4818 6	24 8	4905 5	253	5366 4	276
District	2387 80	237	247 482	251	251 954	255.6	2564 97	260.2	2611 33	265.2	2658 40	27 0. 4	2716 49	275.8	2970 76	301.4	

Source: Bondo District Development Office & District Statistics Office, 2006

The above table shows that both the Total Population and the Population Density in the District is steadily increasing at an increasing rate. As a result, the population continues to exert pressure to the limited resources i.e. land. Consequently, we witness clearing of lands for settlement and agriculture use. Increased population also implies that more pressure will be exerted in the fishing industry, leading to unsustainable exploitation in the industry. Equally, more people will also turn to environmentally unfriendly economic activities like uncontrolled mining and quarrying.

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DIVISION	LOCATION	1999		2011	
		M	F	M	F
	Bondo Township	13747	15455	17040	19158
MARANDA	North Sakwa	3569	4126	4424	5114
	South West Sakwa	1989	2072	2465	2568
	West Sakwa	2024	2059	2508	2552
	MARANDA	21329	23712	26437	29392
	Central sakwa	10347	10838	12826	13434
NYANGOMA	South Sakwa	6291	7316	7798	9068
	NYANGOMA	16638	18154	20624	22502
	Central Uyoma	5271	6030	6533	7474
MADIANY	East Uyoma	6038	6429	7484	7969
	South Uyoma	8560	9399	10610	11651
	West Uyoma	8208	8849	10174	10969
	MADIANY	28077	30707	34801	38063
	Central Asembo	8794	10159	10901	12593
RARIEDA	East Asembo	7556	8634	9366	10702
	South Asembo	4314	5066	5347	6279
	West Asembo	5829	6531	7225	8095
	RARIEDA	26493	30390	32839	37669
	Central Yimbo	3354	3717	4157	4157
USIGU	East YIMBO	3414	3683	4231	4565
	Mageta Island	2079	2163	2577	2681
	North Yimbo	3402	3775	4217	4679
	West Yimbo	8797	8896	10904	11027
	USIGU	21046	22234	26086	27109
TOTALS		113583	125197	140787	154735

Source: Bondo District Development Office & District Statistics Office, 2006

The above table shows that the proportion of female in the total population is more compared to that of the male. This ration is increasing steadily. Majority of females are unemployed and live in rural areas, and hence as there population increases, they continue to exert pressure to the limited environmental resources, e.g. clearing of forests in search of firewood and over-exploitation of soils through un-recommended farming methods

Division	Location	Urban centre	Total Population	
			1999	2011
Maranda	Township	Bondo Town council	29202	36198
Usigu	West Yimbo	Usenge	5771	7153

Source: Bondo District Development Office & District Statistics Office, 2006

The increase in population in urban areas, as indicated in the table above, leads to strenuous use of socio amenities and development of slums.

CHAPTER 3: HUMAN SETTLEMENT AND INFRASTRUCTURE

3.1 Human Settlement & Planning

Prior to colonization of Africa, Kenya's land was informally owned by communities at external level and individuals internally i.e. Luo community owned a section of Nyanza and in the section individuals owned parcels of land.

The colonial government saw the indigenous people as incapable of holding interests in land hence all land was crown land from 1915 however, due to internal pressure in 1926 all land owned by Africans were gazetted and later declared native reserves for their use and interests. In 1963, land consolidation and adjudication and land tenure existing in Bondo include free hold (absolute ownership –the largest), government land, trust land (which can also be leased for instance Yala Swamp, which has been leased to Dominion Farms for 25 years initially with a possibility of extension) and private land. Land issues seem not to be a big threat and many parcels of freehold have not been adjudicated.

Land use types include;

- a) Agricultural production
- b) Urban both for residential and commercial purposes such as Bondo Township, Usenge, Ndori
- c) Social infrastructure such as schools, health facilities. These are available district wide
- d) Forest reserves such as Ramogi, Rambugu and Sirafuongo hills
- e) Recreation such as Migwena Festival & Cultural centre

The district has no regional plan but has local physical plan of 1970s when it was still part of Siaya district.

There are neither settlement schemes nor squatters in the district. Access to basic facilities such as; Water and sanitation-good in Bondo Township but poor in other areas

Energy sources a)	fuel wood-good
	Electricity-fair
Markets & schools	good
Roads	good
Health facilities	fair

Most of the residents both in rural and urban areas have shelters which sometimes are permanent and semi-permanent. Slums are upcoming especially along the beaches

Factors influencing types of shelter in Bondo include cultural beliefs, affordability, availability of building materials, climatic conditions and technology

Areas that need urgent planning services are;

- a) All the beaches to address issues of poor sanitation and slums
- b) Market centres including Usenge, Bondo, Ndori and Daraja because of the increasing socio-economic activities

Environmental concerns in settlements are;

- a) Disposal of solid and liquid wastes
- b) Use of fragile environment such as Yala Swamp

- c) Deforestation

3.2 Human and Environmental Health

Common diseases influenced by environmental factors include;

- a) Malaria-caused by female anopheles mosquito that breeds in clear stagnant water and bushy vegetation that harbours the adult mosquitoes.
- b) Diarrhoeal diseases- include cholera, dysentery, amoebiasis and typhoid being the common cases in the district though cholera occurs as an outbreak. Infection occurs through consumption of contaminated water and food.
- c) Tuberculosis - through inhalation of contaminated air. The infection percentage in the district has increased and also associated with HIV/Aids patients.
- d) Respiratory tract infections-through inhalation of contaminated air.
- e) Gastro enteritis infections-through consumption of water or food.

Status and trend

There is increase in the status of these common diseases related to environmental factors. Malaria cases are the highest. It is endemic though highest during two rainy seasons annually i.e. March to May and September to November during the short rains and long rains respectively.

Diarrhoeal diseases are second in prevalence then respiratory tract infections and finally tuberculosis. The rest occur almost at the same level and percentages are almost equal.

Interventions

- a) Intensification of vector control for malaria
- b) Promoting environmental hygiene to control food and water quality
- c) Advocating for behaviour change through health education e.g. some households acquire mosquito nets but do not make use of them hence putting them at risk of contracting malaria and therefore advocacy on the same should change such behaviour.

3.3 Pollution and Waste generated from Human Settlement

The major sources of pollution come from land and air while solid and effluent wastes form the main sources and others are toxic/hazardous and gaseous wastes (minor).

Solid wastes and effluents form the largest percentage of household, municipal, urban centres and institutions. From hospitals, solid and effluent as well as hazardous wastes are available.

Due to non-existence of disposal facilities as well as sewerage plants, amounts of pollution or wastes cannot be estimated though both of these are increase mainly attributed to the increasing population and urbanization that is on going development in the district.

Key Impacts of the pollutants and wastes to the environment

The impacts of wastes and pollutants to the environment differ with regard to their various types thus;

Solid wastes;

- a) Destroy the aesthetic value of sites
- b) Plastics clog drainage facilities
- c) Plastics also cause death of livestock that feed on them
- d) Contribute to air pollution during decay
- e) Plastics also destroy the soil structure hence compromising the soil quality for agricultural purposes

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- f) Contribute to water pollution during surface run off

Effluent/Liquid wastes;

- a) Lead to water pollution if not well treated
- b) Contribute to contamination of soil and underground water during seeping and leaching
- c) Cause foul smell not healthy for inhalation as they can lead to respiratory tract infections

Toxic/hazardous wastes

These are likely to have irreversible impact to human health and environment. The amounts are very negligible due to the level of development and industrialization. Most of the solid toxic wastes generated from the hospitals are incinerated.

Proposed Interventions

- a) Planning of the towns and urban centres to prioritize disposal facilities of wastes and sewerage plant
- b) Intensification of awareness creation to enlighten the community on their role in waste management.
- c) Investment in recycling of plastics to reduce its menace, provide employment and produce products
- d) Intensive and extensive afforestation and reforestation to increase forest cover as well as provide products for paper production that add to the production levels of the country.

3.4 Communication Networks

The district has roads classified as C, D and E as highlighted below;

Class C- connecting Kisumu from Bondo then to Lwanda Kotieno where a ferry docks.

Class D – connecting Siaya district and Bondo

Class E- connecting important market centres within the district.

Rural access roads-connecting rural centres.

The district has no railway network coverage nor sea ports but water transport (ferry and boats) is predominant and links people from mainland to the islands as well as neighbouring districts in south Nyanza. Fixed line network covers the mainland but not the islands (Magenta, Ndenda and Oyamo) while mobile phone network is district wide with some areas having both or either of Safaricom or Celtel networks.

Key Impacts of the Communication Networks on Environment

Most of the impacts are related to road construction as highlighted hereunder;

- a) Soil erosion along road reserves after construction of roads
- b) Unrehabilitated quarries that are hazards to human and livestock life
- c) Indiscriminate felling of trees of various significance to the economy and the environment normally without replacement

Radio coverage is district wide while postal network covers the important business/market centres in the district.

3.5 Water Supplies

Major water sources are Lake Victoria, pans and dams. Others are piped water, river Yala and boreholes are very few. About 35% of the total population have access to portable and clean water, the rest depend on water from pans, dams or from the lake.

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Time spent to access water especially in the rural areas is about one hour and this had the greatest impact on the girl child who is charged with such duties. It even gets worse during droughts since most of the pans run dry.

The main sources of water pollution include agro-chemicals, defecation in bushes due to lack of pit latrines and waste water that end into water points during surface run off.

3.6 Energy supply

Table 3(a) Use of various energy sources by households in Bondo

Note; The total number of households in Bondo is 57,067

Source of Energy (for cooking)	Percentage of h/holds using energy sources	Key environmental issues	Proposed Intervention
Firewood (mostly used)		Soil erosion Deforestation Siltation of the lake/streams/rivers	-research on tree species that are fast growing to meet demands of the people for energy -promotion of private & institutional tree nurseries -promoting use of energy saving technologies and devices such as improved stoves -promoting use of renewable energy sources by providing capital to institutions for such initiative
Charcoal	8%	„	„
Paraffin	1%	Non-renewable	-promoting use of renewable energy sources by providing capital to institutions for such initiative
Electricity	Negligible	-	-
Solar	Negligible	-	-
Wind	Negligible	-	-
Biogas	Negligible	-	-

Source: Bondo District Agriculture Office 2006

As highlighted, the use of energy here is only for cooking not lighting or for any other use. Most people depend on firewood with a total number of 51, 928 households; charcoal follows with a total number of 4,568 and paraffin with a total number of 571 households. Other sources of energy (electricity, solar, biogas and wind) are not used for cooking

3.7 Sanitation

More than 50% of the total population has access to sanitation facilities such as pit latrines (highest in coverage) and water closet. In some parts of the district, especially in Rarieda due to the lithology of the area, people do not have pit latrines.

Neither the market centres nor urban centres in the district have sewerage facilities in the entire district. People rely on pit latrines which cannot efficiently serve the population at any time of the day.

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Key impacts of poor sanitation include;

- a) Increased chances of contraction of diseases such as cholera
- b) Smelly/filthy environment

Proposed Interventions

- a) Proper planning to prioritize sewerage facilities and solid waste management (sanitation) in towns and the beaches
- b) Provision of financial support to homes and market centres to construct pit latrines
- c) Intensification of health education especially on hygiene
- d) Controlling settlement into the fragile ecosystems

3.8 Health Facilities

The district has 43 health facilities as;

District hospital-1 with three medical doctors

Sub-district hospital-1 headed by Clinical Officer

Health centres- 4, three are headed by Clinical Officers while one by a nurse

Dispensaries- 2, which are headed by nurses

Private hospital-1 headed by a doctor

Private clinics & dispensaries- 15, headed by doctors and nurses, some are mission hospitals

There are also illegal medical clinics and dispensaries operating in the district.

There is deficiency of medical practitioners in the district. All serious cases have to be referred to the district hospital and the four doctors cannot effectively attend to such patients. Among the government health facilities, only the district hospital has doctors. The doctor patient ration is estimated at 1:1700 while nurse patient ratio is estimated at 1:50

The implication is that the poor who cannot afford private health facilities are unlikely to be well attended to, this increases the probability of death cases. The most disadvantaged areas are Mageta and Ndenda Oyamo islands where there are health centres that lack basic facilities such as electricity and thus responding to emergencies is impossible. Accessing the district hospital is very difficult. Patients rely on boats to cross the lake after which they will use road transport to reach the hospital.

Major ailments include;

- a) Malaria with a morbidity rate of 34%
- b) Diarrhoeal diseases including dysentery, gastro enteritis
- c) Respiratory diseases including pneumonia, T.B. respiratory tract infections e.t.c.
- d) Skin diseases such as fungal and bacterial infections
- e) HIV/AIDS with a prevalence rate 23.6%

Proposed Interventions

- a) Improvement in physical infrastructure such as electricity, transport network. The government should even avail a motor boat for patients that require emergency medical attention that have to be referred to the district hospital.
- b) Employment of more doctors and nurses to address that major inadequacy
- c) Appropriate procurement and supply of equipment and drugs
- d) Demand services-from the community. The government should initiate the same
- e) Partnership and linkages to with donors and other health facilities to support in addressing some of the gaps

3.9 Education Facilities

Information on:

1. No. of Pre-primary Schools	-	324	
2. No. of Primary Schools	-	245	
3. No. of Secondary Schools	-	45	
4. No. of Non-formal Institutions	-	01	
5. No. of Technical Institutions -	01		
6. No. of Special Institutions	-	02	} Hearing Mental }
7. No. of Colleges	-	01	
Tertiary	-	01	

Percentage retention by gender

School going age

Std I Boys 5,852

Girls 5,454

Total 11,306

Std 8 Boys 2,674

Girls 2,167

Total 4,841

Retention/Completion from Std 1 to 8.

Boys: 45.69%

Girls: 39.73%

Secondary Percentage retention.

i. Std 8 Total 4,841 against 3,094 who join Form I	-	63.91%
ii. Std I 11,306 to Std 8	-	42.86%
iii. Form I total 3,094 against 1,820 who complete form IV	-	58.82%

School Enrolment

Table 3(b) ECD School enrolment

Age Category	2	3	4	5	6	7	Total
Boys	176	807	1,620	2,138	1,591	531	6,863
Girls	215	896	1,623	2,098	1,565	510	6,907
	391	1,703	3,243	4,236	3,156	1,041	13,770

Table 3(c) Secondary School Enrolment.

	B	G	Total
Form I	1,755	1,339	3,094
Form II	1,466	1,221	2,687

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Form III	1,282	1,059	2,341
Form IV	1,020	800	1,820
Total	5,523	4,419	9,942

Table 3(d) Primary School Enrolment.

Scho ols	1		2		3		4		5		6		7		8		Total	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G	B	G
245	5,852	5,454	5,336	5,045	4,953	4,666	4,940	4,751	4,472	4,376	4,174	3,947	4,401	4,054	2,679	2,167	37,684	36,684

Table 3(e) Number of School Teachers by Gender

	Teachers	Male	Female	Total	Pupil Teacher Ratio
i	Pre-Primary	27	458	485	
i	Primary	1,221	636	1,857	
i	Secondary	334	102	436	

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Key Environmental Challenges/Issues.

8. Sources of water-roof catchments are unreliable and wells shallow.
9. Drainage systems in schools poor.
10. Poor disposal of litter.
11. Inadequate and lack of pit latrines.
12. Lack of trees in most schools to act as wind-brakes
13. Soil erosion not prevented.
14. No defined footpaths.
15. Poor land use – demonstration plots.
16. Air pollution.

Interventions.

17. The Ministry allocated 50,000/= for purchase of water tanks and improvement of sanitary facilities.
18. Quality assurance visits cover environmental aspects.
19. Encourage school to develop tree-nurseries.
20. Pupils and students encouraged to join 4K-clubs, Science Congress.
21. Emergency Fund from Ministry of Education for disaster.

CHAPTER 4: SOILS AND LAND USE

As one of the important non-renewable natural resources that support life on earth, soils in Bondo District are exploited for agricultural production and the building industry. Man, in his pursuit for agricultural production works on the soils and exposes it to the agents of erosion. Soil erosion mainly caused by water is a major cause through which soil fertility is lost in the district. The rainfall which amounts to 800 – 1600 mm per annum is high in intensity and falls within a short period (\approx 3 months). Excessive run-off and flush floods are common occurrence in the district leading to serious environmental degradation. The main sources of run-off include market centres, school compounds, roads, footpaths and cattle tracks.

Table 4(a) : Extent and Distribution of Soil Erosion:

Extent	Extent (Ha)	% of the Total District Area	Geographical Areas of Occurrence	Proposed Interventions
Surface run-off		40%	Maranda, Madiany, Usigu, Rarieda and Nyangoma Divisions	<ul style="list-style-type: none"> • Putting up of soil conservation structures – terracing, stone lines unploughed strips.
Gullies Development		20%	Maranda, Madiany, Usigu, Rarieda and Nyangoma Divisions	<ul style="list-style-type: none"> • Check dams, cutt-off drains • Soil conservation structures
Riverbank Erosion		10%	Maranda, Madiany, Usigu, Rarieda and Nyangoma Divisions	<ul style="list-style-type: none"> • Riverbank pegging • Afforestation • Sand harvesting control.
Land degradation along the lake shore		20%	Maranda, Madiany, Usigu, Rarieda and Nyangoma Divisions	<ul style="list-style-type: none"> • Sand harvesting control • Afforestation

Source: Bondo District Agriculture Office 2006

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The geology consists of Kavirondian System which is composed of alternating layers of sandstone and shales which are slightly metamorphosed. The soils are mainly laterites black cotton soils and some red volcanic soils. From the geological coverage the soil types found range between black cotton sandy loams and laterite including red volcanic soils in the North.

Table 4(b) Distribution, Use and Degradation status of the major soil types:

Type of Soils	Characteristics	Distribution Km ²	% Coverage	Potential Use	Current Use	Degradation Hazards	Proposed Intervention
Black cotton soil	<ul style="list-style-type: none"> • Waterlogging • Cracks when dry • Black in colour 	388.8	40%	<ul style="list-style-type: none"> • Cotton • Groundnuts • Sorghum • G/Grams • Millet 	<ul style="list-style-type: none"> • Cotton • Groundnuts • Sorghum • G/Grams • Millet • Beans 	<ul style="list-style-type: none"> • Soil erosion • Drought • Sand harvesting • Deforestation / Charcoal burning • Riverbank encroachment 	<ul style="list-style-type: none"> • Soil conservation measures • Afforestation • Riverbank protection • Plant drought tolerant crops • Early planting
Red Volcanic Soils	<ul style="list-style-type: none"> • Moderate in fertility • Brown to red in colour • Deep soils 	583.2	60%	<ul style="list-style-type: none"> • Sorghum • Maize • Beans • Cassava • S/Potatoes 	<ul style="list-style-type: none"> • Sorghum • Maize • Beans • Cassava • S/Potatoes 	<ul style="list-style-type: none"> • Soil erosion • Drought • Deforestation / Charcoal burning • Riverbank encroachment 	<ul style="list-style-type: none"> • Soil conservation measures • Afforestation • Riverbank protection • Plant drought tolerant crops • Early planting

Source: District Agriculture Office, Bondo, 2006

Table 4(c) : Land Use Potential

Agro-ecological Zone	Potential Land Use	Current Land Location Use	Extent (Ha)	Constraint/ Challenges	Proposed Intervention
LM ₂	Sugarcane, sorghum	Sorghum, sugarcane & maize	1000	<ul style="list-style-type: none"> • Inadequate rainfall • Low fertility 	<ul style="list-style-type: none"> • Planting of drought tolerant crops • Early planting
LM ₃	Cotton, sorghum, cassava, s/potatoes, maize, beans, horticultural crops	Cotton, sorghum, cassava, s/potatoes, maize, beans, horticultural crops	40,700	<ul style="list-style-type: none"> • Low fertility • Unreliable rainfall • Soil erosion • Striga weed menace 	<ul style="list-style-type: none"> • Planting of drought tolerant crops • Early planting • Use of organic and inorganic fertilizer • Soil erosion control • Striga weed control
LM ₄	Cotton, sorghum, cassava, s/potatoes, maize, beans, horticultural crops	Cotton, sorghum, cassava, s/potatoes, maize, beans, horticultural crops	35,900	<ul style="list-style-type: none"> • Low fertility • Unreliable rainfall • Soil erosion • Striga weed menace 	<ul style="list-style-type: none"> • Planting of drought tolerant crops • Early planting • Use of organic and inorganic fertilizer • Soil erosion control • Striga weed control
LM ₅	Millet, horticultural crops, cowpeas	Millet, horticultural crops, cowpeas	2,000	<ul style="list-style-type: none"> • Striga weed • Low rainfall • Soil erosion 	<ul style="list-style-type: none"> • Plant drought tolerant crops • Early planting

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					<ul style="list-style-type: none"> • Striga weed control • Soil erosion control.
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Table 4(d): Land Use Systems

Ecological Zone	Land Tenure	Land Use Type	% of District Area	Challenges/ Constraints	Proposed Intervention
LM ₂	Freehold		1.25	<ul style="list-style-type: none"> • Inadequate rainfall • Soil erosion • Deforestation • Low soil fertility • Encroachment of riverbanks 	<ul style="list-style-type: none"> • Adopt dryland farming technologies • Soil conservation measures • Afforestation
LM ₃	Freehold	Mixed farming	51.13	<ul style="list-style-type: none"> • Inadequate rainfall • Soil erosion • Deforestation • Low soil fertility • Encroachment of riverbanks 	<ul style="list-style-type: none"> • Adopt dryland farming technologies • Soil conservation measures • Afforestation
LM ₄	Freehold	Mixed farming	45.10	<ul style="list-style-type: none"> • Inadequate rainfall • Soil erosion • Deforestation • Low soil fertility • Encroachment of riverbanks 	<ul style="list-style-type: none"> • Adopt dryland farming technologies • Soil conservation measures • Afforestation
LM ₅	Freehold	Mixed farming	2.5	<ul style="list-style-type: none"> • Inadequate rainfall • Soil erosion • Deforestation • Low soil fertility • Encroachment of riverbanks 	<ul style="list-style-type: none"> • Adopt dryland farming technologies • Soil conservation measures • Afforestation

CHAPTER 5: AGRICULTURE, LIVESTOCK & FISHERIES

5.1 Agriculture

Agriculture is a top priority sector in the District because it is largely rural and the bulk of the population relies on farming and fisheries as their main source of livelihood.

Farming is however carried out for subsistence and the main food crops produced include maize, sorghum, beans, green grams, cowpeas, groundnuts, simsim, cassava, sweet potatoes, kales, bananas and mangoes. The potential exists for high income crops like groundnuts, simsim, maize and legumes through irrigation to ensure that they are available throughout the year. Grain Amaranth production was introduced as a cash crop in the District in 2005 in a bid to alleviate poverty.

These crops are grown in both pure and mixed cropping systems depending on biological and socio-economic factors.

Crop Production Trends:

Out of 972 Km² land surface of Bondo District, 796 Km² is arable although only about 289 Km² (40%) of this is currently tilled.

The farms are average in size (\approx 3 ha). They are not very intensively cultivated and very few improved cattle are kept. Subsistent crops of maize and sorghum are the most important in the District. Extremely low yields and low input level characterize the farming system. Practically all the food produced is consumed locally. There is considerable potential for output increase but a lasting improvement in soil fertility requires the introduction of a proper mixed farming system and the use of increasing amounts of fertilizer. The introduction of a mechanization system based on the use of draught animals is feasible and would help to improve the labour productivity considerably.

Table 5(a): Fertilizers and Pesticides:

	Crop	Fertilizer	Pesticides
1.	Maize	DAP, CAN, UREA	Insecticide
2.	Sorghum		
3.	Finger Millet		
4.	Grain Amaranth	DAP	
5.	Common Beans		
6.	Green Grams		
7.	Cowpeas		
8.	Groundnuts		
9.	Simsim		
10.	Sweet Potatoes		

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11.	Tomatoes	DAP, CAN	Insecticide
12.	Kales	DAP, CAN	Insecticide (Karate)
13.	Onions	DAP, CAN	
14.	Cotton		
15.	Tobacco		
16.	Cassava		
17.	Local Vegetables		
18.	Mangoes		
19.	Citrus		
20.	Bananas		
21.	Pawpaw		
22.	Chilies		

NB: Fertilizer consumption trend has been increasing since the year 2000 to date but it is still very low compared to other more established agricultural districts. Phosphatic fertilizer use in the district is about 1% (10t) while nitrogenous fertilizer is about 0.7% (6.9t)

Priority Issues

- a) Improving soil productivity for agricultural use
- b) Promoting soil conservation measures through reforestation of degraded/eroded sites

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Table 5 (b) : Types and Status of Farming Systems

	Type of Farming Systems	Extent (Ha)	Distribution (% of Total)	Location	Agricultural Product(s)	Status of Current Production Level (Kg/ha)	Potential Production Level (Kg/ha)	Proposed Intervention
1.	Maize (Pure Stand)	6,000	60	District wide	Maize, maize flour, maize stover	1800	2700	<ul style="list-style-type: none"> • Planting of suitable and certified seeds. • Use of fertilizers • Early planting • Striga weed control
2.	Maize + Beans	7,000	33	District wide	Maize, maize flour, beans. Maize and beans stovers	1800	2700	<ul style="list-style-type: none"> • Planting of suitable and certified seeds. • Use of fertilizers • Early planting • Striga weed control
3.	Maize + Cotton	8	2	Madiany Division		13	-	<ul style="list-style-type: none"> • Planting of suitable and certified seeds. • Use of fertilizers • Early planting • Separate planting of maize and cotton

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								<ul style="list-style-type: none"> • Striga weed control
4.	Sorghum	4,724	70	District wide	Sorghum, sorghum stovers	900	1500	<ul style="list-style-type: none"> • Planting of suitable and certified seeds. • Use of fertilizers • Early planting • Striga weed control
6.	Cassava	3,320	20	Maranda, Rarieda Divisions	Cassava tubers, cassava flour, cassava chips	8,000	20,000	<ul style="list-style-type: none"> • Planting of cassava mosaic disease tolerant varieties
7.	Groundnuts	103	30	Rarieda, Madiany, Maranda Divisions	Groundnuts	600	1,000	<ul style="list-style-type: none"> • Planting of improved varieties • Adoption of recommended agronomic practices
8.	Amaranth	10	0.1	Maranda, Madiany Divisions	Amaranth grain, Amaranth flour	1,300	2,000	<ul style="list-style-type: none"> • Adoption of recommended agronomic practices
9.	Cotton	627	20	Madiany, Rarieda Divisions	Seed cotton	500	1,200	<ul style="list-style-type: none"> • Adoption of recommended agronomic practices. • Control of pests and

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								<p>diseases.</p> <ul style="list-style-type: none"> • Use of quality seed and high yielding varieties. • Organize cotton marketing.
10.	S/Potatoes	78	40	Maranda, Rarieda Divisions	Potato tubers, potato flour, potato chips, potato vines	8,000	15,000	<ul style="list-style-type: none"> • Planting of the improved orange-fleshed varieties • Adoption of recommended agronomic practices.
11.	Bananas	124	20	Maranda, Rarieda, Nyangoma, Madiany and Usigu Divisions	Banana fruits, banana stems and leaves	6,000	15,000	<ul style="list-style-type: none"> • Planting of clean and improved varieties • Adoption of recommended agronomic practices. • Pest and disease control especially banana weevil and sigatoka disease.
12.	Mangoes	120	25	Maranda,	Mango fruits,	5,000	10,000	<ul style="list-style-type: none"> • Growing of

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				Rarieda Divisions	Mango fruit juice			<p>improved grafted varieties.</p> <ul style="list-style-type: none"> • Adoption of recommended agronomic practices.
13.	Citrus	48	20	Maranda, Rarieda and Nyangoma Divisions	Orange and lemon fruits, orang and lemon juices	4,000	8,000	<ul style="list-style-type: none"> • Growing of disease-free varieties • Pest and disease control • Adoption of recommended agronomic practices.
14.	Pawpaw	24	10	Maranda, Madiany, Rarieda and Nyangoma Divisions	Pawpaw fruit, pawpaw fruit juice, pawpaw jam	2,000	10,000	<ul style="list-style-type: none"> • Growing of improved varieties • Adoption of recommended agronomic practices
15.	Tomatoes	200	40	Maranda, Madiany, Nyangoma, Usigu and Rarieda Divisions	Tomato jam, tomato fruit	5,000	12,000	<ul style="list-style-type: none"> • Adoption of recommended agronomic practices. • Water for irrigation • Pest and

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								disease control
								<ul style="list-style-type: none"> • Good timing of markets.
16.	Kales	320	60	Maranda, Madiany, Nyangoma, Usigu and Rarieda Divisions	Vegetable	8,000	12,000	<ul style="list-style-type: none"> • Water for irrigation. • Pests and disease control.
17.	Onions	22	5	Rarieda, Maranda and Madiany Divisions	Onion bulbs	3,000	5,000	<ul style="list-style-type: none"> • Water for irrigation • Good timing of markets • Pest and disease control
18.	Green Grams + Maize	70	20	Madiany and Rarieda Divisions	G/gram grains, maize	450	700	<ul style="list-style-type: none"> • Plant green grams in pure stands. • Adoption of recommended agronomic practices
19.	Cowpeas + Maize	45	15	Maranda, Usigu, Nyangoma, Rarieda and Madiany Divisions	Maize, cowpeas seeds, cowpeas leaves	450	700	<ul style="list-style-type: none"> • Adoption of recommended agronomic practices.
20.	Simsim	20	0.2	Rarieda and Madiany Divisions	Simsim seeds Simsim oil	360	600	<ul style="list-style-type: none"> • Adoption of recommended agronomic

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								practices.
21.	Finger millet	190	35	Maranda, Usigu, Nyangoma, Rarieda and Madiany Divisions	Finger millet flour, stovers	630	720	<ul style="list-style-type: none"> • Adoption of recommended agronomic practices.
22.	Local Vegetables (Mtoo, blacknight shade, spider weed, mrere, amaranth etc)	10	50	Maranda, Usigu, Nyangoma, Rarieda and Madiany Divisions	Vegetables	10,000	15,000	<ul style="list-style-type: none"> • Improve on fertility, harvesting and preservation. • Water for irrigation

Source: District Agriculture Office, Bondo, 2006

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Table 5(c) Crop Yield Trends 1999 - 2005

thee									
Crop	1999			2000			2001		
	Ha	Y/Ha	Total Pdn	Ha	Y/Ha	Total Pdn.	Ha	Y/Ha	Total Pdn.
Maize	8,965	12 B	107580 B	8,808	6 B	47,775 B	82.59	12 B	99,108 B
Sorghum	3,856	8 B	30848 B	3,386	4 B	13,544 B	2813	9 B	25,317 B
F/Millet							42.5	7 B	295.5 B
G/Amaranth									
Beans	2,837	6 B	17022 B	2,954	3 B	8,862 B	2448	7 B	17,136 B
G/Grams	125	4 B	500 B	310	4 B	1,240 B	100	6 B	600 B
G/Nuts	311	8 B	2488 B	162	6 B	972 B	78	8 B	624 B
Simsim							10.5	4 B	42 B
S/Potatoes	266	10 T	2655 T	205	5.98 T	1227 T	353.5	13 T	4595.5 T
Cassava	440	10 T	4400 T	568	5 T	2840 T	758	8 T	6182.4 T
Tomatoes	145	18 T	2610 T	163	10 T	1,630 T	238	12 T	2,856 T
Kales	160	15 T	2393 T	208	8 T	1,664 T	361	13 T	4693 T
Onions							19.8	4 T	79.2 T
Cotton	499.7	1 T	499.7 T	782	0.6 T	469.2 T	945	1 T	945 T
Tobacco									
Pigeon Peas							7.5	9 B	67.5 B
Cowpeas	22	4 B	88 B	410	3 B	1362 B	145.5	7 B	1018.5 B
Sunflower							7	10 B	70 B
Soyabean							6.2	15 B	93 B
Coffee	6.94	0.3 T	2.25 T	9.18		3.67 T	9.18	0.4 T	4 T
Bananas	13.2		158.4 T	34.03		108.5 T	55.72	10 T	557 T
Citrus	2.75		82.5 T	14.521		47.63 T	17.7	*25 T	450 T
Mangoes	80.23		800 T	80.35		804 T	84.75	12 T	1017 T
Pawpaw							10	20 T	200 T
Chillies									
L/Vegetables							12	9 T	108 T

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2002		2003		2004		2005						
Ha	Y/Ha	Total Pdn.	Ha	Y/Ha	Ha	Y/Ha	Total Pdn.	Ha	Y/Ha	Total Pdn.		
11,319	13 B	147,147 B	9469	13 B	10,425	7 B	55020 B	13,080	12 B	151,360 B		
3,743	10 B	37,430 B	3,920	10 B	39,200 B	3,822	6 B	22932 B	4	10 B	47,240 B	
24	7 B	168 B	30	6.6 B	198 B	217	4 B	1079 B	190	7 B	1,330 B	
								10	0.5 B	5 B		
2,399	7 B	16,790 B	3,296	6.6 B	21,797 B	2,944	3 B	3607 B	4,660	6 B	26,820 B	
68	6 B	408 B	111.5	7 B	755.5 B				69	7 B	483 B	
153	8 B	1221 B	146	9.8 B	1,430 B	150	7 B	1185 B	102.	7 B	962.5 B	
13	4 B	52 B	16.5	3.7 B	61 B	2	4 B	8 B	20	4 B	80 B	
351	15 T	5265 T	143	14 T	2,015 T	254	10 T	2540 T	77	11 T	855 T	
1190	20 T	15,552 T	1,527	20 T	18,320 T	1,970		29 T	3,320	15 T	29,550 T	
177	15 T	2655 T	134	10 T	1,340 T	306	10 T	3060 T	200.	4	12 T	2,489 T
164	10 T	1640 T	17.1	9.5 T	1,492 T	422	14 T	5,932 T	320	11 T	3,421 T	
22	4 T	88 T	17.1	4.7 T	80.37 T	18.9	5 T	94.5 T	22	5 T	110 T	
1602	1 T	1602 T	966	1 T	966 T	964	0.8 T	771.2 T	627	1 T	627 T	
						6	1 T	6 T	14	1 T	14 T	
1	10 B	10 B										
48	10 B	480 B	214	9.8 B	2,097.2 B	45	5 B	270 B	43	6 B	258 B	
2.1	15 B	31.5 B										
9.18	0.2 T	2 T	9.18	0.2 T	2 T							
89.62	12 T	1080 T	108.5	12 T	1,111.44 T	123.6	12 T	1111.27 T	123.	12 T	1,111.2 T	
33.3	20 T	600 T	57.1	30 T	1,713 T	48.15	30 T	530.4 T	48.1	30 T	530.4 T	
97.15	10 T	900 T	111.0	20 T	2,341 T	119.8	20 T	1,695 T	119.	20 T	1,695 T	
14.05	20 T	200 T	20.3	20 T	290 T	24.26	20 T	330 T	24.2	20 T	330 T	
									8.5	1 T	8.5 T	
10	10 T	100 T	13	7 T	91 T	12.5	9 T	112.5 T	10	10 T	100 T	

Cotton is the major and so far the only important cash crop grown in the District but unless marketing problems are addressed, no major achievement can be realised

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Fertilizer Consumption Trend 2000 – 2006

Fertilizer consumption in the District is still very low. Phosphatic Fertilizer use in the district is about 1% and Nitrogenous Fertilizer 0.7% which is very low. The main consumers of these are maize and horticultural crops.

Table 5(d) Fertilizer consumption trends 2000 - 2003

Fertilizer Type	2000	2001	2002	2003	Req. 2003
Phosphatic	4.5	6.1	6.0	10	1220.6
Nitrogenous	2.2	4.6	2.5	6.9	977.4

Pesticides Use:

Use of pesticides which are mainly fungicides and insecticides in the district is also low mainly in horticultural crops. These are kales and tomatoes. With the introduction of commercial farming it is envisaged that pesticide use will increase.

Key Environmental Issues:

- a) Soil erosion
- b) Deforestation
- c) Cultivation/encroachment of riverbanks and water sources
- d) Cultivation on steep slopes.
- e) Striga weed menace
- f) Land degradation along the lakeshore.

Priority Issues/Proposed Interventions:

- a) Promoting best agricultural issues e.g. organic farming, agroforestry
- b) Adoption of conservation agriculture such as minimum tillage , contour ploughing to reduce soil erosion
- c) Construction of soil and water conservation structures in cultivated areas like terracing, use of stone lines and unploughed strips.
- d) Planting of trees
- e) Avoid cultivating river banks and steeply slopping areas.
- f) Adoption of conservation agriculture as a technology for crop production.
- g) Striga weed control.
- h) Afforestation and controlled sand harvesting.

Pollution, wastes and degradation associated with Agriculture

Mainly water and soil pollution and contamination due to misuse leading to surface runoff and leaching leading to contamination of such points

5.2 Livestock Production

5.2.1 Livestock production systems.

Livestock production systems in Bondo district vary a lot depending on the specific enterprise in question. Even within a particular livestock enterprise, various production systems may be present

Cattle

There are two distinct types namely indigenous and improved or exotic. The indigenous are reared under free range whereas the exotic tend to be under zero – grazing (total confinement with all feed requirements provided by farmer) or semi – zero system (where the animals graze for some time and are then confined to receive supplements).

Sheep and goats

Whereas all the sheep are indigenous, there has been an introduction of exotic dairy goats in the recent past. The sheep and indigenous goats are kept under free range production system, while the dairy goats are mainly reared under the zero – grazing system.

Poultry

Local domestic birds including turkeys, ducks and geese are produced under free – range. Commercial birds which include layers and broilers are confined, with broilers being exclusively under deep litter system and layers divided into deep litter or slated floor production system.

Pigs

About 80% of the pigs are reared under free range where the swines scavenge for feedstuffs from garbage heaps and also graze on whatever forage they can obtain. The remaining 20 % of the pigs are kept under confinement and given all the feed requirements in their sties.

Donkeys

All the donkeys are kept under free range production system.

Bees

Bees are kept in hives which are confined to secluded sites. However, a small number of colonies occupy non – conventional sites like chimneys, roof ceilings, trees etc.

Table 5(e)

Livestock population trends 2002 - 2005

No.	Type of livestock	2002	2003	2004	2005
1.	Cattle Grade	410	426	446	480
2.	Local	104,070	108,741	108,750	110,000
3.	Sheep	49,264	52,430	52,530	56,000
4.	Goat (Local)	111,844	119,661	129,229	140,000
5.	Goat (Dairy)	-	-	83	130
6.	Pigs	2,122	3,200	2,550	3,000
7.	Donkeys	4,930	5,850	6,715	6,950
8.	Poultry indigenous	156,200	177,875	195,663	210,000

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9.	Layers	2,910	3,445	5,200	6,000
10.	Broilers	4,575	150	5,340	7,000
11.	Cockerels	875	136	2,650	3,050
12.	Ducks	3,090	4,100	4,500	4,900
13.	Geese	326	406	760	840
14.	Turkeys	440	650	890	980
15.	Pigeons	14	15	670	900
16.	Quills	248	250	230	500
17.	Apiculture log hive	49	50	54	60
18.	KTBH	508	608	1,200	1,300
19.	Lang troth	67	82	150	20
20.	Rabbits	1,265	1,390	1,460	1,700

Source: Annual Report 2005, Department of Livestock Production

There is a slow rate of growth in the dairy sector due to sensitization and promotion of the enterprise as an option to create wealth, increase farmer earnings and diversification of sources of income. The main constraints were incidences of Trypanosomiasis and tick borne diseases, inadequate skills on husbandry, high initial capital investment and inadequate production of fodder and pasture.

Dairy Goat keeping is an emerging enterprise in Rarieda and Madiany divisions of the District. The population of the Dairy goats has continued to increase as was previously predicted with the help of CBOs, Micro – finance organizations and other NGOs coming in to provide grants and loans to help farmers get initial breeding stock. Notable partners were (CENT, MCDP, Care for the Earth & Heifer Project International).

Table 5(f) Livestock fodder

FEED TYPE	AREA (2004)	AREA(2005)	Remarks
Natural Pasture	292,500 Ha	290,000 Ha	Slight decrease
Napier Grass	355 Ha	360 Ha	Slight increase
Sweet potato vines	45 Ha	40 Ha	Slight decrease
Fodder trees	10.4 Ha	15.0 Ha	Increased due to increase in number of dairy goats
Cow candy	1.0 Ha	0.5 Ha	Only one farmer has planted
Rhodes grass	4 Ha	6.0 Ha	Increased due to successful awareness creation
Farm by products/ Crop residues	11,589 Ha	16,000 Ha	Big increase due to failed short season rains hence more immature crops available.

Source: District Livestock Production Office, Bondo, 2006

Natural pastures formed the bulk of feed for grazing livestock in the District. It is estimated that Natural pastures produced 523 Tons of grass as standing hay during the two seasons. This is what sustained the indigenous cattle, sheep and goats during the year.

5.2.2 Production patterns

Milk production

A total of 9,634,440 million litres of milk worth Kshs 347,019,840 million was produced in the district. The zebu cattle provided 9,098,966 million while dairy herd produced 540,478 litres of milk. The potential demand was 22 million litres. The district had a milk deficit of 12 million litres. The dairy cows averaged 6.5 lts milk/day while Zebus gave 1 lt/day on average.

Beef production

The population of zebu increased from 108,741 in 2004 to 110,000 in 2005. The indigenous cattle comprise 99% of the total cattle population in the District and form the back bone of livestock industry with an off take of 8% per annum. A total of 1,291.95 tons of meat was produced valued at Kshs 180,873,000 million.

Productivity of indigenous cattle in the District is expected to increase through sustained upgrading of existing herd by use of bull schemes or Artificial Insemination services, better feeding regimes drenching and effective tick control.

Sheep

The sheep population was estimated to have increased from 52,430 in 2004 to 52,000 in 2005 representing an increase of 0.2% with an off take of 15% per annum; 115,168.6 kg mutton was produced valued at ksh18, 389,899 million.

The limitation of sheep production is attributed to inbreeding and poor husbandry practices.

Goats

The goat population was estimated at 140,000 in 2005 representing an increase of 8.3% compared to 129,229 in 2004. Goats had a higher off take of 35% with Chevon production of 673,533.945 kg valued at Kshs. 101, 030,091.75 million.

Pig production

The population of pigs was 3000 in 2005 compared to 2,550 in 2004. This represented a decrease of 17.6% with an off take of 64% a total of 153,538.5 kg was produced valued at Kshs. 18, 424,627. This significant increase in production was attributed to improve housing hence fewer piglets lost due to roaming around.

The main limitation to pig production is inadequate local source of high quality breeds and high initial capital for investment into the enterprise hence most pigs are kept in free range. They are found roaming in most market centers. The department of Veterinary services and

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Livestock production launched a campaign to have them housed, an effort that showed signs of success. However in the absence of a sustainable market the gains could be lost.

Poultry production

Over 94% of poultry consist of indigenous poultry estimated at 210,000 birds in 2005 compared to 195,663 birds in 2004. The increase of indigenous poultry by 7.3% in 2005 compared to 2004 is attributed to local poultry improvement trainings held in various divisions through common interest groups in collaboration with FAO–Netherlands Food Security Project Department.

Only 6.9% is improved poultry consisting of layers, broilers and cockerels. The other 2.8% poultry population consists mainly of ducks, turkeys, and geese.

Farmers are beginning to venture into commercial exotic poultry production despite the high initial cost involved due to agricultural credit provided by the AFC.

Table 5(g) Poultry products

Product	Quantity produced	Requirement	Deficit	Remarks
Eggs	103950 trays	1500600 trays	1396650 trays	Deficit sourced from other districts
Chicken meat	88 tons	22813 tons	22725 tons	Consumers opt for other types of meat

Source: District Livestock Production Office, Bondo, 2006

Table 5(h) Beehive numbers, occupancy and production

Type of hive	Total no	No.Harvested
Log hive	6	5
KTBH	1,300	1,100
Lang troth	200	185
Total	1,506	1,190

It is estimated that a total of 19,350 kg of honey was produced in the district valued at Kshs. 5, 224,500 million, while 8,170 kg of wax was produced with estimated value of Kshs. 1,634,000 million. Beehive population for 2005 was double the population for 2004. This was attributed to the successful partnership between the department and CBOs/NGOs and Micro Finance Institutions whereby farmers were given grants or loans to acquire hives.

The prospects of increased honey and wax production are high in the district. However constraints against realizing the optimum production of honey and wax were as follows;

- Apathy towards Bee keeping farmers
- Poor husbandry practices (skill of handling bees, poor kiting and harvests)
- High cost of hives and beekeeping equipments.

Donkeys

There is a steady increase of donkeys in the district from 3,962 in 2001 to 6,715 in 2004. This was attributed to the need for workload easing for farm work, plowing and domestic transport.

The main constraint in the growth of this enterprise included tse -tse fly infestation and lack of proper husbandry methods. The donkeys work for long hours without water or feed.

Rabbit production

There were an estimated 1460 rabbits in 2004 with an off take of 20%, this compared favorably with 1,700 in 2005. It is estimated that 494.7kg of rabbit meat was produced valued at Ksh 494, 000. Rabbit production in the district had inadequate attention compared to its potential. There is need to promote this industry by popularizing rabbit meat consumption especially among the adults.

5.2.3 Regulatory and Institutional Arrangements

Movement of livestock into and out of the district is controlled by the Veterinary Act. Movement as well as no – objection permits are issued to all who wish to import or export livestock into or out of the district. However a few unlicensed animals do slip through the system resulting in a disease control nightmare. Whenever a notifiable disease is detected in a particular area, a quarantine is declared to control the spread as well as to manage the disease, usually by vaccination campaign.

Priority Issues

- a) Improvement of milk and beef production
- b) Intensification of bee farming being integrated with other farming activities
- c) Improvement of poultry production
- d) Assessment of carrying capacity of the forest reserve and the development of a grazing plan to minimize environmental degradation due to overgrazing
- e) Promoting production of improved cattle breeds

5.3 Fisheries Resources

Types of Fisheries Production Systems

1. Capture Fishery of Lake Victoria

Mainly on commercial fish species which include;

- Nile Perch
- Tilapines
- Omena

The Fishing gear employed in this kind of production include

- Wooden canoes – over 3000 in the district
- Nets of various types and construction
- Hooks
- Traps

There are slightly over 9000 fishermen operating in the district with about 73 landing beaches. Most of the landing sites lack the proper infrastructure that would allow for hygienic handling of fish and proper disposal of waste.

2. Aquaculture

The potential for aquaculture is great and efforts are being made to promote it through development of fishponds. There are 10 fish farmers in the district with 18 fishponds.

Status and Trends of Fisheries Development

Currently, there are 3 main commercial species harvested. Nile perch is processed for export, whereas Tilapia and omena are consumed locally. (in Kenya). Fish landings have been declining over the last decade due to a complex interplay of socio-economic and environmental factors.

Excessive fishing pressure has been blamed for the declining fish stocks. Invasive weeds such as the water hyacinth have also been blamed for declining catches apparently because the weeds block fishing grounds and beaches. Aquaculture is still in its primary stages of development and is yet to pick up.

Alien species and threats to habitat

Nile perch – introduced in the 1900 to control haplochloromines.

It is a predator and hence preys on other fish, thereby destabilizing the populations of those species.

Regulatory and institutional arrangements

The Fisheries Department is the government agency responsible for the management of the fisheries resource of Lake Victoria. Management is through the use of Fisheries Act CAP 378. The department operates through Fisheries Officers who are deployed at landing beaches to ensure that fishermen fish in accordance with Good Fishing practices. (GFP).

Environmental Issues

- a) Pollution of the lake and the beaches with solid and liquid wastes
- b) Lake Recession due to poor use and management of the lake

- c) Over fishing and Use of destructive fishing gear
- d) Destruction of wetlands

Intervention measures

- a) Awareness creation on need for control of pollution and best management practices –by NEMA, Local Councils
- b) Research on factors leading to Lake Recession by LVFO, EAC
- c) Reducing the use of Destructive fishing gear by Fisheries Department
- d) Addressing Unsanitary conditions at the beaches by Fisheries department, local councils
- e) Conservation of wetlands by NEMA and Forest department
- f) Undertaking transboundary natural resource management meeting between Kenya and Uganda to resolve the conflicts
- g) Improving monitoring to reduce use of illegal gears
- h) Promoting aquaculture to reduce stress in the lake

CHAPTER 6: WATER RESOURCES

Kenya has been classified as a water deficit country yet water is vital for the sustenance of all life. Adequate quantity and quality of water is recognized as a basic requirement for economic growth.

6.1 Distribution of Water Resources.

6.1.1 Ground water reserves

These include boreholes, shallow wells and springs.

They are fairly distributed within the administrative Divisions in the District.

6.1.2 Drain water harvesting.

These include the roof water catchments, run-off feeding water pans. A number of water pans and the roof catchments are mainly towards the Southern part of the District. The free rain here is rather flat rising from 1140m above sea level (as l) to 1180m a.s.l.

6.1.3 Rivers and lakes

River Yala which borders the District towards the North is the largest and it empties its water through the Yala swamp and eventually into Lake Victoria. There are a few seasonal rivers/ streams un-evenly distributed in the district.

Lake water covers a surface area of 1000 sq Km with a shore line distance about 300 kms.

6.1.4 Wet lands

They are mainly distributed along the shore line and concentrated around Yala swamp where river Yala empties its water. The total hectare of wet lands in Yala Swamp is about 17,500. So far 7,000 ha has been developed / reclaimed for agriculture. A few patches are around Sinyanya, Uyawi, Nyandiwa and Rayalo.

Table 6(a) Water resources distribution in Bondo.

Divisions	Piped schemes	Bore holes	Shallow wells	Roof catchments	Improved pans/dams	Total
Maranda Nyangoma	4	7	48	30	21	107
Usigu	7	4	8	11	10	37
Rarieda	5	5	66	240	7	318
Madiany	4	2	5	20	12	40

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TOTAL	20	18	127	301	50	510
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Source: Water Resources Management Authority (WRMA) Office, Bondo, 2006

Table 6(b) Identified Catchment Areas

	Name and Location of Catchment	GPS Readings	Catchment status and recommended conservation measures
i	Ramogi Hill Usigu Division	X = 0618685 Y = 9999455 S = 00.00493 ⁰ E = 0.3406651 ⁰ Alt. = 1171m	Well conserved catchment under KEFRI Maseno management
ii	Rambugi Hill Rarieda Division	X = 0651320 Y = 9989151 S = 00.09813 ⁰ E = 034.35975 ⁰	Conflict in management between the Community and Department of forest Bondo over land ownership
iii	Abiero Hill Nyangoma Division	X = 0640407 Y = 9979079 S = 00.18923 ⁰ E = 034.26171 ⁰ Alt = 1179m	Not protected. A few tall scattered trees in shrubs. Requires afforestation
iv	Naya Hill Madiany Division	X = 0645592 Y = 9960336 S = 00.358 ⁰ E = 034.30831 Alt = 1291m	Un-protected catchment mainly shrubs and rocks. Deforestation (mainly for charcoal burning) resulted in the present state. Requires Afforestation.
v	Anyango Hill Rarieda Division	X = 0654464 Y = 9988731 S = 00.10194 ⁰ E = 034.39797 ⁰ Alt = 1331 m	Catchment in communal land proposed WRUA formation here. Un protected catchments. Human encroachment evident.
vi	Usenge Hill Usigu Division	X = 0654462 Y = 9988731 S = 00.10194 ⁰ E = 034.05144 ⁰ E = 00.07450 ⁰ S Alt = 1166m	Protected by Department of Forest in good state

Source: Water Resources Management Authority Office, Bondo, 2006

6.2 Drainage Patterns

Hydro-logically, the District falls under L. Victoria Drainage Area which is referred to nationally as Drainage area 1. The District consists of three Sub-drainage Basins of IFG, IHC and IHB as shown on the attached map of drainage patters.

6.3 Status and Trends of Water Resources.

- Gradual decrease in water quantities from several streams/springs/boreholes is evident resulting from water catchments degradation in the District.
- Development of water resources unable to keep pace with water demand due to increase in population and inadequate funds.
- Unsanitary conditions at Beaches along L. Victoria pose pollution hazards.

6.4 Regulatory and Management Arrangements

WRMA is a corporate body created under water Act 2002 to oversee the management, use and development of water resources in the country.

The mandates of WRMA include the following:

- a) Develop water resources management policies and procedure
- b) b) Monitoring and evaluation of the National water Resources strategy and implementation
- c) Managing water catchments areas.
- d) Collecting information regarding water resources management and advising on water resources management trends.
- e) Apportionment of water use – Issuance of water permits and enforcement of permit conditions.

6.5 Main Water Uses

- Mainly Domestic and Livestock usage
- Irrigation at Yala Swamp – Dominion Farm.

Dominion Farms Ltd is a private investment that was licensed by the government of Kenya to undertake rice irrigation and other activities including agro-based industrial production and growing alternative crops. In its interest to do rice irrigation, it is a main water user of River Yala that drains into L.Victoria and also used by the local community. There has been concern on sufficient water flow down stream for the users due to construction of river weir where amount of water is being controlled. These are some of the issues that have been taken into consideration by the Technical Environment Committee. Water gargets that read water level have also been placed both upstream and downstream for monitoring.

Figure 2: Dominion Farms river weir



6.6 Access to Safe Drinking Water

Only 30% of the District population has access to clean drinking water. The rest depend on pans, dams, rivers, streams and Lake Victoria. This condition predisposes the community to higher risks of contracting water borne diseases such as typhoid and cholera. Majority of them do not observe basic hygiene activities such as boiling water before drinking

6.7 Impacts of Water Use and Demand on the Environment & Natural Resources.

- ✓ Depletion of water sources due to riverine cultivation
- ✓ Siltation of pans and Dams – dry up for 3-4 months annually due to poor agricultural practices on the upper catchments.
- ✓ Pollution of water sources due to agro-chemicals
- ✓ Low water levels due to over usage – Boreholes

6.8 Key Environmental Issues in Management and Utilization of Water Resources.

(i). Water apportionment

- There are quite a number of illegal water abstractors operating without permits
- There are those whose permits have expired but they continue with illegal use

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- There are those who are not adhering to the permit conditions – use more than permitted.

(ii). Water Pollution

- Pollutants from urban/ peri-urban centres and rural facilities.
- Pollutants from agro-chemicals
- Leachates from waste dumps

(iii). Watershed degradation due to deforestation, overgrazing and infrastructure construction

(iv). Water Resource use conflicts.

- o No major conflicts known except a few cases of crocodile and hippos giving threats.
- o Animal Vs Human conflicts – exists to a small extent
- o Human Vs Human conflicts – non existence.

6.9 Proposed Interventions

- i. Harmonization and proper enforcement of existing acts regarding river bank protection and water catchment area conservation and protection.
- ii. Strengthening / capacity building of community management structures.
- iii. Creation of awareness on government policies regarding catchment management.
- iv. Gazettment of wetlands, water catchment areas and ground water recharge areas
- v. Promoting public participation through formation resource users associations in conservation effort
- vi. The government to initiate projects to promote sustainable use of the waters of the lake

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Table 6(c) Sources and Status of Water Resources

Source	Status		Usage	Management System	Challenges/ Threats	Proposed Interventions
PANS / DAMS	3-4 months dry annually	Not safe for drinking	Livestock & domestic	Community	Poor management system Pollution and siltation	Capacity building for the communities on sound management
L. VICTORIA	Abundant	Fair	Livestock & domestic Minor Irrigation	WRMA/ Community B.M.U at beaches only	Pollution, siltation Lake recession	Sound management policies be spelt out. Need full treatment before use
R. YALA		Fair	Livestock & domestic	WRMA/ community	Pollution by agrochemicals from farms Reduced levels	Riverine monitoring regularly and prosecute illegal abstractors and polluters.
BOREHOL ES		Mostly saline	Livestock & domestic Minor & major irrigation	Community	Over-usage ownership	Capacity building on management & ownership
ROOF CATCHMENT		good	Domestic	Individual	Inadequate rains	Financial assistance for further develop.
Seasonal rivers/Dry streams/springs			Domestic Livestock	community	In most cases regarded as gift from God	Capacity building on management

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Table 6(d) Priority Issues and Interventions

NO	Prioritized issues / challenges	Current interventions	Proposed intervention in the plan period 2006 - 2010	Responsible institution	Remarks
1	Riverine cultivation	Verbal warnings at Barazas which are not taken seriously	Regular patrolling of river banks after pegging and marketing bank boundaries. Prosecution of culprits	WRMA NEMA	Riverine marketing and pegging Ex. Be executed by WRVAS with WRMA leading
2	Deforestation	Sketchy warnings with no proper management procedures	Gazettement of forest areas/ catchment areas	WRMA NEMA FOREST	
3	Water Pollution	Verbal warnings at Barazas	Introduction of polluter pays principle and regular monitoring of all water courses	NEMA WRMA	
4	Over- grazing	No. policy	Creation of awareness on the adequate no. of livestock to be owned	ML & F	
5	Soil Erosion	Sketch verbal exchanges at chief's Barazas	Clear land policy and Agricultural policies regarding Agricultural practices.	MoA	

CHAPTER 7: FORESTRY & WILDLIFE RESOURCES

7.1 Forestry

7.1.1 Types of Forests and Their sizes

Bondo district has only hill tops with varied indigenous tree species and some parts of these hills enriched with exotic trees species such as Callistris Robusta, Cupressus lusitimica, Grevillea robusta, Eucalyptus and Cassia species. These hills are under local authority as trust lands. They include:

Ramogi forest reserve (283Ha) in Usigu Division
Usenge hill (83 Ha) in Usigu Division
Matar Hill (not surveyed) in Usigu Division
Rambuğu hill (5.4Ha) in Rarieda division
Nyagoko (not surveyed) in Rarieda Division
Abiero Hill (62Ha) in Nyang'oma division
Mbaanga (not surveyed) in Nyang'oma division
Uyawi hill (not surveyed) in Nyang'oma division
Sirafuongo hill (not surveyed) in Nyang'oma division
Ndere Sindo (not surveyed) in Madiany division
Adola Kunya hill (not surveyed) in Madiany division
Naya hill (not surveyed) in Madiany division
Usire hill (not surveyed) in Maranda division
Abom hill (not surveyed) in Maranda division

7.1.2 Status and trends of forests

Status

Most of the hills in the district are in good natural condition except a few such as Abiero, Rambuğu and Matar which are encroached on for extraction of building poles and charcoal burning by the neighbouring communities. This is due to high level of poverty and high demand for forest products such as fuel wood, building materials and expansion for agricultural production. Ramogi hill which is basically used for cultural aspects and forest research work is in good condition. These forest resources can attract eco tourism activities such as camping sites, bird watching site etc. the riverine vegetation of river Yala is conserved but some areas are cultivated up to the river banks. Rehabilitation of degraded sites is of great importance to reduce on siltation of Yala swamp.

Trends

Open bushes in the district have been reduced due to expansion of agricultural production. Most of the hill tops are still conserved with minimal collection of dry firewood. A few hills are totally destroyed due to charcoal burning, exploitation for building materials and removal of fresh wood for firewood which is sold to beach dwellers; this is mainly in Nyang'oma division. Off late, most communities in the district have realised that adverse weather is due

to degraded environment, thus they have seen need for environmental conservation for sustainable agricultural production.

7.1.3 Regulation and Management of Forests

Forest Regulation

Forests in the district are mainly regulated by forest department personnel, Provincial Administration (chiefs' offices) and communities. Though the forests usually fall under local authorities' jurisdiction, their role is quite inactive. The Forest Department has deployed forest guards in most delicate areas such as Ramogi, Usenge and Rambugu to minimise degradation.

Forest Management

The management of forest reserves is mainly done on Ramogi, Usenge and Rambugu hills through the support of Forest Department. In Ramogi forest, Kenya Forest Research Institute has established several research plots which are doing well. The Forest Department has done enrichment. Planting of trees on the slopes to act as a buffer, has also been carried out by the department. During dry season, the department organises for and maintains fire breaks to prevent forest fires; this also involves the neighbouring communities through creating awareness on the dangers of forest fires. Cultural beliefs have also assisted in good conservation.

7.1.4 Forest Exploitation

Forests in the District are classified under dry land forests. This makes these forests mainly suitable for maximum conservation.

Timber:

Forests within the district are mainly for conservation; a few of the hills are poached by the neighbouring communities for building materials. This is not legalised; most of timber used in the district is imported mainly from Rift Valley Province. A few farmers utilize the mature woods from their farms by applying for permits from the Forest Department.

Non – timber products:

Most members of communities neighbouring the forest reserves extract the following:

- ◆ Thatching grass
- ◆ Medicinal materials for both domestic and commercial purposes
- ◆ Mushrooms especially in Ramogi hill
- ◆ Soil for colouring houses
- ◆ Ropes and twines
- ◆ Dried firewood
- ◆ Stones (Hard core)
- ◆ Sand

7.1.5 Environmental Issues

The District is embroiled in several environmental issues such as:

- (a) Environmental degradation due to charcoal burning, extraction of firewood and poor agricultural practices which lead to severe erosion
- (b) Traditional burning of swamp areas such as the Yala swamp during dry season; these fires extend into neighbourhood forests such as Ramogi and Usenge.
- (c) Poorly managed livestock which roam and damage vegetation especially along the lakeshore; this interferes with breeding sites of fish.
- (d) Encroachment of forest areas for economical purpose
- (e) Lack of adequate forest products
- (f) High levels of poverty, which leads to encroachment of forest resources.
- (g) Disappearance of valuable timber tree species such as *Chlorophora excelsa* and *Albizia gummifera* due to prolonged drought, which affects vegetation growth.
- (h) Lack of Environmental /forest management plans for continuous implementation to realise positive results for livelihood sustenance.
- (i) Conflicting policies, rules, regulations and laws; this lead to confusion among natural resource users and enforcers of these policies and laws.
- (j) Lack of motivation for natural resource users in items of investment to boost natural resource base.
- (k) Low understanding levels of natural resource users on sustainable management of natural resource to enhance sustainable development.

7.1.6 Interventions for environmental challenges

- ◆ Enforcement of environmental rules, laws and vegetation
- ◆ Introduction of environmental education through participatory methodologies (seminars, workshops and trainings).
- ◆ Involving various stakeholders in field days, marked environmental celebrations such as launching of National tree planting, World environment days etc.
- ◆ Involving farmers in proper land use plans, and incorporation of woodlot establishment i.e. farm tree planting.
- ◆ Encourage farmers or land users to establish wood lots targeting markets such as transmission poles and pulp wood materials.
- ◆ Involving local authorities and other institutions in setting aside a piece of land for tree planting.
- ◆ Introduction of non timber projects such as apiaries, sericulture, mushroom farming e.t.c
- ◆ Introduction of highly valuable timber species
- ◆ Establishment of water pans which can assist in sustainability of enterprising projects such as tree nurseries and irrigation horticulture.
- ◆ Training farmers to use modern technologies in farming

Table: 7(a) Types of Forests in Bondo

TYPE OF FOREST	EXTENT (Ha)	DISTRIBUTION (%OF TOTAL)	LOCATION	FOREST USES	STATUS				PROPOSED INTERVENTIONS
					Gazetted	Under trust land	Private land	% degradation	
Ramogi Forest Reserve	283 Ha		Usigu Division	Cultural Research Source of minor Forest products Grazing	-		-	5%	Enrichment planting and buffer zone planting. Establishment of Research plots Maintenance of forest boundaries Involving neighbourhood community on planting trees in their forms and gazettement
Usenge Forest Reserve	83 Ha		Usigu Division	Religious ceremonies Source of minor forest products Wildlife habitat	-		-	10%	Hilltop planting, buffer zone planting, boundary clearance and maintenance, creating an awareness and training neighbourhood communities on farm tree planting. Recommended for gazettement Development of mgt plant
Matar hill	-		”	Conservation Grazing Source of minor forest products	-		-	25%	Rehabilitation
Rambu Hill	5.4 Ha		Rarieda Division	Conservation Grazing Source of minor forest Products	-		-	22%	Carry out enrichment planting Develop Buffer zone by planting Fast growing and five resist and tree Species. Recommended for gazettement.
Got Abiero	63 Ha		Nyang’oma Division	Conservation Grazing Source of minor forest products	-		-	35%	Rehabilitation by planting fast Growing tree species. Identification of proper boundaries And mark them to avoid encroachment.

7.2 Wildlife Resources

Status

-different animal species exist such as crocodile, hippos (in the lake), terrestrial ones include antelopes, wild pigs

- no protected areas exist and the available species roam subjecting them to illegal poaching as well as causing human-wildlife conflicts
- cases of hippos killing people, destroying crops and causing injuries have been reported in past years; crocodiles have caused deaths of fishermen
- no comprehensive description of district fauna has been undertaken

Priority Issues

- taking stock of wildlife resources to provide information on need for a protected area and tourism promotion
- management of human-wildlife conflicts
- curbing illegal poaching

Actors

- Kenya Wildlife Service, Provincial Administration, NEMA, Forest department, Ministry of Planning & National Development

CHAPTER 8: BIODIVERSITY CONSERVATION

8.1 Types of Tree Species

Accacia species: these are well distributed in the District especially in the lowlands and along the river valleys. The number is reducing due to charcoal burning.

Balamites aegyptica (otho): is mainly found in the low lands with black cotton soils

Albezija coriava / gumitera: these species is mainly along the banks of the River Yala and on the slopes of hill tops which are well distributed in the District. The main threat is that mature wood of this species is salvaged and converted into timber

Ficus tonmingii sycomora and natalansis: these species are mainly found along river Yala and some parts of Lake Victoria .is exploited as medicine and also is believed to be sacred.

Marthamia lutea and platy calyx: the species is well distributed in the entire district. It is mainly exploited for building traditional houses and mature wood sawn into timber.

Chlorophora excelesa: is a species linked to cultural beliefs and people fear felling it. It has prime timber and is mainly found in the slopes of Ramogi hill facing Yala swamp and is also used for medicinal purposes (bark and twigs)

Lamea SPP: this is evenly distributed in the region and used for medicinal purposes and conserved in the homesteads for shade.

Euphoria trichi callii: this tree species is used for cultural purposes and mostly well conserved but when old falls naturally, it is converted into firewood.

8.2 Rare, Threatened Invader and Vulnerable Species in Bondo

Water hyacinth: is the rare threatened invader in the Lake Victoria; it becomes a nuisance on the landing beaches.

8.3 Species Conservation Status

The most conserved tree species is *Chlorophora excelsa* and *Ficus* species due to their cultural linkages which people fear to use them. Tree species in homesteads are also conserved due to social aspects; farmers/individuals who have established commercial woodlots, are well conserved. Also trees and other plants planted in the institutions such as schools, churches and administrative offices are well conserved and managed well.

Conservation of various status depends on both socio – cultural and socio – economic issues. Plant species which are linked to cultural aspects are purely conserved and remain in good state. Species which can be utilized and converted into products for sale are mainly exploited and some are facing depletion. Alien species which is not familiar to communities are purely conserved especially in forest areas and along the lake shores. Grazing and arson fires interfere with species conservation due to browsing and consumption by fires. Forest provide habitat for animal species.

8.4 Types of Utilization, Beneficiaries & Stakeholders of Bio Diversity

Types of Utilization

Grazing and browsing for both livestock and wildlife

Fruits used by human beings, birds and wildlife .e.g. monkeys

Some plants are used for vegetation

Use of animals as source of proteins

Extraction of medicines such i.e. herbal medicines

For cultural and economical purposes

The use of some plants as food.

Major beneficiaries are the local community though they are less involved in the management issues

Stakeholders

The local community

Relevant government institutions such as NEMA, Forest, KEFRI

CHAPTER 9: ENERGY SECTOR

9.1 Types & Status of Energy sources in Bondo

- a) Firewood mostly used by the local community because of affordability (most households access it for free) and availability. 98% of the population depend on it. Fuel wood is not abundant as it was 10 years back due to continued logging without replacement and clearing for land for settlement and crop farming.

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- b) Charcoal second most used after firewood. Some of it is locally available while some are imported from Uganda through L. Victoria. Mostly used by the middle class that is the type of households that can afford to buy. 70% of the households depend on it for cooking. Availability has tremendously reduced and prices have gone up, this is mainly attributed to deforestation without replanting.
- c) Electricity mainly used for lighting because of affordability. More than 705 households rely on electricity for lighting. An estimated 20% of households depend on it.
- d) Solar this is a renewable source of energy but it is estimated that only 3% of the households, institutions and business premises rely on it for both lighting and heating.
- e) Wind readily available and least used. Only rural households depend on it for preparation of cereals such as maize, sorghum and millet.
- f) Kerosene/gas/biogas kerosene is mostly used for used for lighting in rural households while the in urban households it is used for both heating and lighting. Use of gas for cooking is associated with urban households. It is also considered expensive to households where 41.1% leave below the poverty line. Biogas is a potential energy source that has not been fully tapped. A few schools through support from a CBO are piloting on it.

Rural Electrification programme is ongoing and has extended to cover parts of Maranda and Rarieda Divisions

Table 9(a) Trends in Energy Production & Projections

Source of Energy	Point of production	Point of consumption	Per capita consumption	Environmental Impacts
Fuel wood	Within Bondo	District wide especially rural areas	-	Deforestation Soil erosion Reduced soil fertility Siltation of the lake
Charcoal	Within Bondo while some from Uganda	District wide, most urban centres	-	”
Electricity	Outside the district	Urban centres and market centres	-	Felling of trees to pave way for poles
Solar	-	Urban areas	-	-
Wind	-	-	-	-
Kerosene/gas/biogas	Outside the district	District wide	-	Non-renewable

Source; District Agriculture Office, 2006,

Proposed Interventions

Table 9.(b) Interventions

Prioritized Issues/Challenges	Current intervention	Proposed intervention in plan period (2006-2011)	Remarks
1. High level of deforestation	NEMA and Forest dept doing awareness creation on such dangers and insisting on extensive tree planting	Intensive support for rural households to plant more trees -use of energy saving stoves	A better approach needs to identified
2. High dependency on fuel wood and non-renewable energy sources	Encouraging replacement of cut trees Agriculture, Forest dept & Plan Kenya (in Madiany) have introduced improved eucalyptus species & trees for charcoal production.	-extensive promotion of such high value trees -intensive capacity building for communities & institutions	„
3. Unexploited potentials of renewable energy sources		Financial support to institutions that are piloting the use of renewable energy sources such as solar & biogas	MPs should allocate some CDF money for such

Source; District Agriculture Office, Bondo, 2006

CHAPTER 10: INDUSTRY, TRADE & SERVICES

10.1 Industrial sector

Types of industries in Bondo (as classified by Ministry of Industry, Trade & Services) are;

- Agro-based; meat & dairy products, feed mill, confectionary, hides & skins (rural tanning), honey processing, wood products, furniture & fixtures, juice processing. Cottage industry in this case include honey processing, juice processing, milk processing, bread & confectionary and pottery.
- Artisan/jua kali; carpentry, tailoring & dress making, metal fabrication (welding), blacksmith & tinsmith.
- Service industry; garages, bicycle transport “*boda boda*”
- Building & mining; brick making, sand harvesting and gold mining.

Table 10 (a)

Raw materials and products from these industries are as highlighted hereunder;

Raw material(s)	Product(s)
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<i>Agro-based</i>	
Fish offal/skeleton	Fishmeal
<i>Cottage industry</i>	
Fresh milk	Sour (mala) milk, fresh milk, ghee
Fresh fruits	Fresh juice
Hides & skins	Semi-processed hides and skins
Wheat, flour, sugar, yeast	Cakes, scones, doughnuts
Non-refined honey	Refined honey
Clay soil	Pots
<i>Juakali/Artisan</i>	
Timber	Furniture, fixtures
Clothing material	Apparels & non-apparels
Metal	Fabricated metal (window & door grills, frames), furniture
(Scrap) metal	Assorted metallic products; boxes, jikos, jembes, sufurias, spoons

Source: Trade and Industry Office, Kisumu, 2006

Trends in industrial development in Bondo are not discernable. Any form of value addition on the products is at a very small scale and in fact not documented. There is no major/formal industry other than Bondo Fishmeal Limited.

Industries in Bondo; the district has only one formal industry, Bondo Fishmeal Limited

As stated earlier trends in industrial development in the district is not documented though a few have come up especially the cottage industries. Potentials are there it is only exploitation that is a challenge. Such potentials include;

- Fish processing, fishing support infrastructure such as cold storage, omena drying using solar
- Cotton ginning
- Edible oil processing such as sunflower, sim sim, cotton seeds
- Commercial bee keeping/honey processing. At the moment, Dominion Farms Ltd has embarked on out grower programme where they are buying non-refined honey from farmers and in fact their bee hives have been given to dedicated farmers in both Bondo and Siaya districts.
- Fruit farming and processing especially mangoes and citrus
- Flour milling and mixing
- Bakery
- Boat making

10.1.1 Key Environmental Issues in the Industrial Sector

The few industries in the district pose various environmental threats that also endanger the lives of the people. Bondo Fishmeal Ltd located in Kopolo village in Nyango'ma division, which is the only major industry in the district has ideally environmental problems which if not addressed, their impacts stand to greatly affect a number of people in the region.

Some of the environmental challenges include;

- An offending smell exudes from the sedimentation tanks, aeration ponds and sewage trench. Most workers have reported stomach problems due to foul smell from the factory. This poses risk of digestive and respiratory problems to the surrounding community
- The factory has only 2 aeration ponds that are not effective in effluent treatment. The effluent from the last pond in the series drains into a small stream called Dag Omolo, which has rendered the water unsuitable, both for human and livestock consumption. The polluted stream finally drains into Lake Victoria.
- Due to use of ammonia solution during steaming, the roof of the factory is corroded and part of it blown out, thus another health hazard to birds and people.
- Occupational safety requirements/regulations are not adhered to.

Figure 3: Part of the corroded and blown out roof of Bondo Fish meal ltd



Figure 4: 1st aeration pond of Bondo Fishmeal Ltd, the white layer is murky fat that does not allow air and sunlight to penetrate to assist in treatment



Sand harvesting is a source of income for the community. The waters of Lake Victoria bring with them a lot of sand through waves which get deposited along the lakeshore. The only challenge is the method of harvesting which is destructive to the lake shore ecosystem and destruction of accessibility routes to the lake by both people and livestock.

Gold mining mainly done by local community using crude methods in Wagusu, Ramba, Opoda and Arom is another activity with dangers such as open deep pits that might cause accidents leading to disability and even death, dust and poor disposal of the remains of mercury (for washing the gold ore) likely to cause respiratory problems.

Carpentry, brick making and pottery immensely lead to deforestation, erosion due to bareness of the soil and destruction of the landscape.

Oil spills and poor disposal of the same from garages have a great potential of contaminating water bodies in the future. The effects as at the moment may not be quantifiable due to lack of studies and secondly, there are a few garages and they only handle minor repairs. Though this should not be overlooked since as the district continues to develop, such services are expected to increase.

10.1.2 Regulatory & Institutional Arrangements

The District environment Office (NEMA) is mandated by supervision of all environmental activities in the district and offering the necessary advice in accordance with the provision of EMCA. Also, such activities must undertake annual environmental audit to enhance compliance to EMCA.

The District Environment Committee holds quarterly meetings and makes recommendations to the industries on various environmental issues that should be addressed.

The local authority also creates by-laws that are relevant to such facilities that regulate their activities.

10.1.3 Current mitigation measures

- a) Burning wastes such as polythene bags, which only a few individuals are practicing
- b) Awareness creation on best management practices of wastes by NEMA
- c) Networking with CSOs, currently NEMA and Plan, Kenya are working together in addressing some environmental issues related to pollution

10.1.4 Proposed Mitigation Measures

- a) Adopting cleaner production technologies

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- b) Strengthening the DEC
- c) Enforcing EMCA and other relevant laws
- d) Conducting research on possible alternative use of wastes and/or better methods of waste disposal
- e) Adequate sensitization and awareness on environmental issues, EMCA and need for compliance
- f) Continuous supervision and monitoring by NEMA and other relevant institutions
- g) Government to provide incentives such as tax waivers, rebates, subsidies and environmental loans or awards to firms committed in adopting CPTs.
- h) NEMA to train inspectors as well as giving prosecutorial powers
- i) NEMA with Kenya Bureau of Standards to develop standards that industries should bench mark on.
- j) Establishing appropriate sites and ensuring proper waste disposal.
- k) Ensuring proper restoration is done after completion of mining or sand harvesting by backfilling, tree planting e.t.c.
- l) Draft policy on sand harvesting guidelines should be made applicable to all the regions where there is sand harvesting
- m) Management committees to be established among sand harvesters as well as development of sand harvesting plans.

10.1.5 Management Challenges

- a) Ignorance and selfishness among resource users
- b) Lack of awareness among the public
- c) Inadequate personnel and financial resources in the office

Table 10(b) Type & Impact of Industries on Environment

Type of Industry	Raw materials	Product	No. of people employed	Wastes (solid, liquid and gaseous)	Key Environmental Impacts	Mitigation measures
1. Agro-based	Fish offal	Fish-meal	Less than 30	-Waste water -foul smell -smelly/ polluted fat	- air pollution due to foul smell posing a risk of respiratory & complications among the locals -burnt vegetation around the ponds	-constructing 5 aeration ponds instead of 2 -raising chimneys high -using recommended solutions to liquidify and reduce the smell from the fat and raw

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						materials
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Source: Trade and Industry Office, Kisumu, 2006

Table 10 (c) Priority Issues & Intervention

Prioritized Issue/Challenge	Current Intervention	Proposed Intervention in the plan period	Remarks
1. Ignorance among community members and developers on the relationship between development & environment	Awareness creation though not yet effective	1. Adequate awareness creation to developers & community on EMCA, Industrial development and environment	Need for adequate funds and personnel
2. Impunity among the developers	Recommendations from relevant submitted to the factory on best practices	2. Adequate enforcement of EMCA and other relevant laws	Training of environmental inspectors and giving them powers to prosecute
3. Lack of technical knowledge on treatment and disposal of wastes	„	3. Conducting research on disposal or making use of such “unique” wastes	Government support

10.2 Trade Sector

The main types of trade of trade conducted in the district are; distribution, wholesale, retail and hawking. The main traded goods are fuel/oils, pharmaceuticals, fish, beer/spirits, foodstuffs, farm products. Challenges on trade liberalization are mainly lack of control of products coming into the district and substandard and counterfeit goods that affect the local production. Most of the substandard goods are cheaper and due to ignorance and high poverty levels, most people opt for them unaware of long term costs such as health hazards related to them. There are no clear trading patterns in the substandard and counterfeit goods in the district.

Due to the type of trade as well as the goods traded in, the main key environmental challenge is waste management. The district lacks a sewerage plant as well as established disposal sites and in most cases solid wastes are scattered all over. The biggest nightmare is the management of polythene bags which has become the most available packaging material. Consumers after using their products normally dispose the bags anywhere where they get scattered all over as they are also easily blown by the wind.

Table 10 (d) Trade & Impact of Trade on Environment

Type of trade	Raw materials	Product	No of people employed	Wastes (solid, liquid & gaseous)	Key Environmental issues	Mitigation measures
Wholesale/ retail/distri	Livestock, Cereals, pulses,	Hides, skin, meat e.t.c.	Large	Solid wastes	-health hazard to livestock if	-burning used polythene bags

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bution/hawking	consumer goods			mainly polythene bags, food remnants Droppings from livestock	eaten -destruction of scenic beauty -bad smell during decay	and other materials
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Source; Trade and Industry Office, Kisumu, 2006

Table 10 (e) Priority Issues & Interventions

Priority Issues/Challenges	Current Intervention	Proposed Intervention	Responsible Institution		Remarks
			Lead Agency	Others	
1. Disposal of solid wastes (polythene bags)	Burning	Incineration using locally available materials such as metallic tanks	Bondo County and Town Councils	NEMA	Very hard to manage plastics
2. Disposal and management of other solid wastes such as food remnants	Dumping in open sites	Construction of appropriate dumping site	„	NEMA, Public Health	The councils need to source for funding

Source; Trade and Industry Office, Kisumu, 2006

10.3 Services Sector

The major services in Bondo include transport i.e water transport, road transport (vehicle and bicycle transport), garages, telecommunication, banking.

Water transport occurs mainly in Lake Victoria and minor in River Yala. In Lwanda Kotieno, there is a ferry that makes 2 trips daily to Mbita in South Nyanza, boat transport is also common taking from one beach to another as well as from Bondo to Uganda. Some of our local transport also bring a lot of charcoal to Bondo from Uganda and at the same time has been feared to be the source substandard and counterfeit goods. Less than 10 garages offer their services to vehicle owners in the district. Bondo township, also the district headquarters has a total of 4 garages.

Road transport which includes vehicle transport internally from one urban or shopping centre to another, from Bondo to Kisumu and Siaya and from Bondo to Nairobi. Other common road transport is the bicycle transport which was introduced about 8 years back, known locally as “*boda boda*” transport. These go short distances within the district.

Telephone communication is not as dominant as mobile phone communication. Mainly offices and learning institutions use land lines and a few private houses for the daily operations while many have resorted to use of cell phones. The district gets the coverage of the Safaricom and Celtel networks.

The district has a total of 5 hotels only in Bondo township that provide services such as accommodation and conference halls for seminars or workshops

Only one bank i.e. Kenya Commercial Bank Ltd is offering its services to the people. Others are Micro-Finance Institutions (MFIs) which include CENT Sacco, SAGA and Community Aid International. The MFIs target the small scale business people and have their branches along the fish landing sites in the district.

Table 10(f) service Sector Linkages to Environmental Degradation

Service sector	Linkage (Impact to Environmental Degradation)	Proposed Interventions
Garages	Oil spills	Town planning
Hotels	Disposal of solid wastes and waste water	Construction of sewerage treatment plant

Source; Trade and Industry Office, Kisumu, 2006

Table 10(g) Priority Issues & Intervention

Priority Issues/ Challenges	Current Intervention	Proposed Intervention	Responsible Institution	Remarks
Waste water	Discharge to open drains Use of septic tanks & exhausters	Construction of sewerage treatment plant	County & Town councils	
Solid waste	Burning Unplanned dumping	Construction of planned dumping sites	„	

Source; Trade and Industry Office, Kisumu, 2006

CHAPTER 11: TOURISM

The sector is yet to be exploited to a large scale commercial sector. However, there are improvements in the development of hotel industry; there are also increased numbers of medium class hotels (five in number within a period of 3 years) that are mostly used for workshops, seminars and by local tourists. The district is also covered by the leading cell phone networks i.e. Safaricom and Celtel. Physical infrastructure is yet to be fully developed especially upgrading of feeder roads.

11.1 Potential of Tourism in Bondo

- a) Geographical features such as the vast lake that would create sport fishing, boating and cruising safaris, islands such as Mageta, Denda and Oyamo for camping safaris.
- b) Ecotourism- wildlife birds and wild aquatic animals such as waterbucks, crocodiles, sitatunga at Yala Swamp.
- c) Cultural; there is Migwena Sports and Cultural Festivals, Jaramogi Oginga Odinga Mausoleum and also Ramogi Hills, the prehistoric site regarded as the origin of Luos.

No environmental threats exist due to the low level of exploitation in the sector. Though if exploited, one big threat is pollution and waste management since the district lacks sewerage plant and disposal facilities.

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Management of this sector is usually left with the Local Authority, which in this case is the Bondo County Council for the cultural type of tourism while Kenya Wildlife Services (KWS) will be in charge of wildlife areas promoting ecotourism

As much as figures on the number of tourists might not be provided but it has been established that the number has been increasing over the years. In addition, visitors on official duties such as workshops also add up as tourists as they visit sites of attraction such as Ramogi Hills

11.2 Proposed Interventions

The proposed interventions therefore are attempts to address the issue of exploiting the sector, which has a lot of potential namely;

- a) Development of infrastructure (upgrading of feeder roads, expansion of electrification program, upgrading of existing and construction of more health facilities, increasing access to safe water and sanitation)
- b) Eradication of water hyacinth along some beaches along the lakeshore
- c) Aggressive marketing of tourist attraction sites by the councils and Kenya Tourist Board both locally and outside.
- d) Establishment of tourism resort centers at the islands (Mageta, Ndeda and Oyamo)
- e) Improvement of Naya Peninsular National Reserve
- f) Improvement and marketing of the Oginga Odinga Mausoleum
- g) Promoting ecotourism

Table 11(a) Priority Issues and Interventions

Priority issues/challenges	Current intervention	Proposed intervention	Responsible institution	Remarks
1. Poor/inadequate infrastructure	None	Infrastructure development as cited above	Kenya Tourist Board, Ministry of Health, Bondo County Council, KWS	
2. Marketing of tourist attraction areas	None		Kenya Tourist Board, Bondo County Council	
3. Water hyacinth eradication	None		Kenya Agricultural Research Institute	
4. Developing tourism centers at the islands	None	Establishment of tourism centers at the islands	Bondo County Council	

Source: District Development Office & Bondo County Council, Bondo, 2006

CHAPTER 12: MINING & QUARRYING

12.1 Mining

The district is endowed with a few minerals in which case most of them are vested in the Local Authority (Bondo Town Council), these include aggregates/ballast, building stones, sand while gold which is defined by the Mining Act and authority in charge is the department of Mines and Geology.

In Bondo, there is artesian (small-scale) mining, which is not legal and mainly done for subsistence purposes. The method used is crude, manual and very slow. Areas where this activity is on going are Wagusu, Abom, Opoda and Ramba. There is also a multinational company AfriOre that came in early 2006 to explore where they drill and/or cut trenches and later backfill once they are through.

It may not be easy to develop the trend of gold mining in Bondo since the only known firm that was licensed to undertake mining in the district known as San Martins operated upto 2003 and no documentation on the quantity of gold exists. Being a multinational company that is interested in the economic benefits from the activity, they pulled out when the gold deposits reduced or did not economic value to them though if more deposits are explored there is a high possibility of more investors coming in.

12.2 Key environmental issues in the mining sector include;

- Land degradation especially soil surrounding the mining area is left loose and is likely to fall over when wet or easily eroded by run off
- Occupational health hazards. No safety requirements are adhered to. The miners expose themselves to mercury, a heavy metal which causes respiratory and related complications. Also, the method of disposal is unsound, mainly done by burning.
- Panning; washing the ore to get the gold itself involves use of the mercury and water. Water in this case is the streams or rivers used by both livestock and human beings for consumption.
- Dust being associated with respiratory problems if inhaled
- Noise pollution
- Destruction of scenic beauty

Proposed Interventions

- Legislation/ Mining Act should be reviewed to integrate the interest of small scale miners
- Capacity building the miners on safety regulations such as use of mercury
- Awareness creation on environmental issues related to mining

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Table 12(a) Types of Minerals & methods of extraction

Type of Mineral	Method of mining	Land tenure/ ownership	Geographical location/name of mine	Size of mine ha.	Quantity extracted (annual)	Waste produced
Gold	-Manual -Prospecting	Demarcated	Wagusu, Opoda, Abom, Ramba	Wagusu –over 2 ha; others are random	N/A	Tailings, dust, waste rock, extracted soil

Source: Mines and Geology Department, Kisumu, 2006

Table 12(b) Priority Issues & Interventions

Priority Issues/Challenges	Current Intervention	Proposed Intervention	Responsible Institution	Remarks
1. Legislation has no provisions on artesian mining		Reviewing the Mining Act	Parliament	
2. Inadequate training	Training-minimal	Intensive training	Geology & Mines Dept	

Source: Mines and Geology Department, Kisumu, 2006

12.3 Quarrying

Only done by individuals without use of explosives, thus done at small scale. From 2004, road contractors that have been working in the district have made use of such quarry sites to get the materials for the road construction. Local labour has always been used without use of other advanced machinery.

12.4 Sand Harvesting

Sand mining is one of economic activities in the district. Most of the activity takes place along the shore of Lake Victoria or along River Yala. Water tides and run off after heavy rains pile a lot of sand along the lakeshore or along the river. The harvesting is done by local communities as Community Based Organizations or individuals and have been faced with management problems especially on funds use.

The extent of sand harvesting has been on increase, which is being attributed to increasing population that has to provide for the basic needs for its households. Many widows who are bread winners have resorted to the activity as their source of livelihood. Sites have been damaged and in some cases the District Environment Committee has intervened and in extreme cases, the groups have ordered to stop their activity to allow for healing up.

Key Environmental Issues

Some of the negative impacts are as stated hereunder;

- a) Erosion of lakeshore and riverbank. The shore of lake Victoria has been washed away leaving ugly and scary sites to other users such as livestock and women fetching water.
- b) Destruction of indigenous trees and habitats of some wildlife along the riparian zone
- c) Siltation of the lake leading to pollution and reduction of water levels

- d) Destruction of docking areas of fishing boats

Figure 5: Erosion due to sand harvesting at Kamariga Beach (Picture), the raised part is a public path



Proposed Interventions

One of the major problems facing sand harvesting in this district is poor management among its users where they have unsustainably harvested sand and fighting amongst themselves to have the biggest share. To ensure sustainability, therefore the following interventions should be implemented;

- a) Formation of one organized group/CBO to run and manage the sand harvesting in each and every beach through consultation with relevant government agencies such as Social Services
- b) Development of sand harvesting plans. The plan allows harvesting to be done in one area (Site A) as the other (Site B) piles up, when site A is cleared, the group moves to B as the A heals up and piles. This activity is done rotating from one site to the next.
- c) Regulation of sand harvesting through proper enforcement of EMCA that allows mining in required sites. Prohibiting scooping of sand along the shores, and subjecting such activities to Environmental Audit.
- d) Rehabilitation of the damaged sites by planting the appropriate tree species and establishing the appropriate soil conservation measures

Table 12(c) Methods of sand Extraction

No .	Source of sand	Method of sand harvesting	Geographical location/name of site	Size of site (ha)	Quantity Extracted (annual)	Regulatory agency	Environmental Impacts
1.	Lake	Manual scooping	L Victoria/Kamariga Beach in Madiany division	Less than 1 ha	Not known	County Council	Erosion of shore line, Siltation of the lake, destruction of

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							habitats,
2.	”	”	L. Victoria/Ludhi Beach in Nyang’oma division	”	”	”	”
3.	Sandy hills - erosion	”	Got Abiero in Nyang’oma division	”	”	”	”
5.	Lake	”	L. Victoria/Wichlum, Nyang’oma division	”	”	”	”
6.	Lake	”	L. Victoria/Usenge, Usigu division	”	”	”	”
7.	Lake	”	L. Victoria/Kadedi in Rarieda division	”	”	”	”

Source: Bondo County Council, 2006

12.4.1 Sand Harvesting Sites

- a) Kamariga Beach-the beach is a fish landing site as well as sand harvesting site. Two CBOs namely Kagwa Planters and Sand Harvesters and Kamariga Quarrying and Sand Harvesting group were registered by the department of Social Services to harvest sand at the said beach. Due to lack of management structures, they have scrambled for the resource which has led to overexploitation of sand, environmental degradation and conflict among the groups themselves (enmity has emerged). The DEC has intervened through barazas in the area and one key resolution was to temporarily stop the activity for the site to heal up. They were further advised to form one group that will oversee the management of the activity as well as benefits accrued from sand harvesting. The DEC realizes the need to rehabilitate the site due to the level of damage.
- b) Ludhi Beach, a landing site for fish and its expansion in being threatened by sand harvesting by individuals.
- c) Wichlum beach. This is a fish landing site which has good fish catches. Sand harvesting is threatening the success of this beach and there is need to harmonize these activities. Through Lake Victoria Fisheries Organization (LVFO), European Union is funding the Beach Management Unit to construct a modern fish landing site. This is a great opportunity since fishing is major source of economic activity and the district has a number of landing sites but lack modern structures that meet the EU market standards that in the main consumer of the fish products. This further explains the need to address sand harvesting issues at the said beach.
- d) Got Abiero; sand found at the foot of hills after run off. This has caused serious erosion on the hill and there is need to control the erosion to avoid more of these effects.

Table 12(d) Priority Issues & Interventions

Priority	Current	Proposed	Responsible Institution	Remarks
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Issues/challenges	Intervention	Intervention	Lead agency		
			Lead agency	Others	
Unco-ordinated sand harvesting	Conducting public barazas	-Formation of one management committee -Development of sand harvesting plans	County council	NEMA, Agriculture, Fisheries	
Land degradation	”	Rehabilitation of degraded areas	”	”	
Destruction of fish landing sites	”	Allocation of sand harvesting sites and adequate law enforcement	”	Fisheries NEMA	

Source: Bondo County Council, 2006

CHAPTER 13: ENVIRONMENTAL HAZARDS & DISASTERS

Environmental disasters in the district are climate or weather related. Most of them are natural rather than man made and a few cases have been reported to have led to the destruction of livelihoods and environment.

13.1 Extent and Trends of Environmental Hazards & Disasters

. *Floods*; mostly occur along River Yala during the months of April and May causing damage to crops and homes. The most prone area is Usigu division.

Excess rainfall, *El-Nino* occurred in 1963 and 1998 respectively. The water levels especially in Lake Victoria rose and this submerged homes and schools causing deaths, damage to infrastructure and private property.

Droughts & Famine, the two phenomena are interrelated. Sources say that every famine occurs after every five years during droughts. These have been from 1980 to 1985 to 1990 to 1995 to 2000 to 2005, the most recent. These famine seasons have local names for instance in 1985 it was called “*mak nungo chwori*” to mean hold the waist of your husband because he is the absolute breadwinner and since he cannot provide better die together with him. From August 2005 to February 2006, there was a long period of drought that posed a big challenge to survival of livestock and people. The worst hit areas were Nyang’oma and Madiany. The government sent relief food in the district to sustain the people. Most of the pans and dams that serve both domestic and livestock needs were dry.

Disease outbreaks have occurred in Bondo in 1990s. Some reported cases include cholera and dysentery outbreaks. This has been due to water contamination, poor sanitation and poor personal hygiene. The majority of the local community depends mainly on water from Lake Victoria, River Yala, pans and dams which are not protected from any kind of pollution. Livestock take water and people draw the same water from particular points, without any formal treatment and drink it.

Animal disease breakouts also occur. The most common is the New Castle disease in chicken twice a year in the months of August and December. This has been attributed to a lot of traveling during festivities thus spreading it.

In 1960s and 1970s, trypanosomiasis in cattle caused by tsetse fly was common in the district especially along the shores of L. Victoria and R. Yala. Areas affected included Nyawita, Usire and Goye. This was drastically reduced by a government programme, Farming in Tsetse Control Areas (FITCA), which was funded by EU.

Between September 2003 to April 2004, there was Foot and Mouth disease breakout. The Veterinary Office issued Quarantine which helped in its eradication.

HIV/AIDS not only in Bondo but the whole country has been termed a disaster. The prevalence rate stands at 34%. Women especially the school going age are more infected and affected than the counterparts. Most of the households are headed by kids or old men and women who are not productive due to the pandemic. This has impacted negatively on the education of girls with many drop outs reported due to lack of school fee and also the need to fend the siblings.

Wind outbreaks; the most severe one has been caused by tidal waves from the lake, locally known as “*nakoyi*”. It has caused large number of deaths of fishermen and damage to property .The most recent killed fishermen and caused damage to Sifu primary school in Nyang’oma division. Fire outbreaks have also been reported mostly in boarding schools and homes which occur due to negligence and arsonists’ acts.

Wild fires; common during dry seasons between December and January almost yearly. Also triggered by careless hunters who smoke. Mostly affected area is Usire in Maranda division and Got Abiero in Nyang’oma division. These cause destruction to homes, crops, trees and grazing land.

There is also a concern on motor boats and the ferry in the lake with regard to oil spillage during commotion. The ferry moves from Lwanda Kotieno to Mbita twice daily and there is need to establish occurrences of oil spills as well as motor boats that cross to Uganda and during fishing.

Table 13(a) Types of Hazards and Occurrence – trends 1960 t0 date

Year	1960s	1970s	1980s	1990s	2000s	2005	Remarks
Type of disaster	El Nino Famine Trypanosomiasis New castle Drought	El Nino Famine Trypanosomiasis New castle Drought	Famine Drought New castle	Floods Famine Drought New castle	Famine New castle	Drought Famine New castle	

13.2 Traditional Coping Mechanisms

Depending on the kind of disaster, the community had different coping mechanisms thus;
Famine;

- a) The affected people visited relatives who had food in store and sourced from them
- b) Children could be adopted or could stay with food secure relatives
- c) Financial support from relatives in town

Floods

- a) The victims were supported by community members with basic needs such as food and shelter
- b) Migration to raised points such as hilly areas

Wildfires

- a) Community co-operation in stopping fire using soil

Animal Diseases

- a) New castle diseases was treated with herbs that were known to people keeping chicken. They used aloe, pepper, sisal leaves and a certain creeping plant which were mixed and ground then added to their drinking trough or spoon feeding.
- b) Foot and Mouth disease was treated by taking the cattle to muddy areas where their feet were blocked by the mud.

Diarrhoeal diseases by feeding patients with millet or sorghum porridge. In serious cases there were herbs administered on them by the medicine men.

13.3 Disaster Risk Reduction (DRR) Strategies

- a) Early warning in cases of predicted occurrences in the district.
- b) Training the community and other relevant stakeholders on response in case a disaster strikes. These have been done by line ministries as well as relevant NGOs such as Red Cross Society.

Measures to lessen the Effects of Environmental Disasters

These include prediction, monitoring and warning as well putting in place the right infrastructure in case of any occurrences. To this end this has not been successful in the district mainly because of lack of capacity and inadequate financial resources.

13.4 Environmental Mitigation Measures

- a) Disaster Management Committee has been established in the district to inform of any possible outbreaks or occurrences

Proposed Interventions

- a) Preparedness is very vital in reducing the impacts of disasters. The government should employ experts to warn and engage people in preparedness for such disasters
- b) Need for capacity building. The established Disaster Management Committee including the local community should be trained to know the likelihood of occurrences of disasters and be able to respond in time
- c) The government should heavily invest in devices to help in detection and monitoring of disasters.

District Environmental Response Mechanisms

These include seeking for aid from the government such as relief food and seeds as well as NGOs dealing with disaster management.

Status of Early Warning Systems & Preparedness

Table 13(b) Sector Capacities for Disaster Preparedness and Response

Sector	Type of disaster	Human resource	Technical equipment	financial	Coordinating mechanism (logistics)	Lead agency
Water	Floods	Water engineers	Vehicles	Needs adequate support		Provincial Administration
Agriculture	Drought and famine	Crop officers	Vehicles	”		”
Health	HIV/AIDS	Doctors, counsellors	Drugs Test kits	More support needed	Check ups	Ministry of Health

Source: District Environment Office, Bondo, 2006

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Proposed Interventions

The table below identifies the current measures undertaken with relevance to existing policies. Each measure is disaster specific. Proposed interventions have been identified but the biggest challenge in financial capability.

Table 13(c) Priority Issues & Interventions

Priority Issues/ Challenges	Current Intervention	Proposed Intervention during the Plan period (2006-2011)	Responsible Institution		Remarks
			Lead	Others	
1. Ensuring that Bondo is food secure	<ul style="list-style-type: none"> -Introducing drought tolerant crops. -Promotion of private nurseries to help improve on forest cover -Revolving fund for farmers -Promotion of (junior) farmer field schools 	<ul style="list-style-type: none"> -Encourage and promote fruit tree farming especially mango and citrus -More awareness creation on drought tolerant crops -revolving funds to continue as well as grant to the poor of the poorest -Extension services not to be demand driven especially to Junior Farmer Field Schools -promotion of fish farming 	Agriculture	<ul style="list-style-type: none"> Forest Fisheries NEMA Livestock Dominion Farms Ltd 	
2. Achieving behavioural change	<ul style="list-style-type: none"> - advocacy on behaviour change -Free Antiretroviral -V.C.T. -Home based care -Financial and moral support to orphans and the infected 	<ul style="list-style-type: none"> - More advocacy on behaviour change -Ensuring every HIV/AIDS patient accesses ARVs -Grants/loans for investment in farming and education 	Health dept	<ul style="list-style-type: none"> Line ministries FBOs NGOs 	
3. Controlling New castle	<ul style="list-style-type: none"> - Vaccination of at 1/= per chicken 	<ul style="list-style-type: none"> -More Awareness creation on the need for vaccination -Alerting farmers on the need to control chicken movement during periods of breakouts 	Veterinary	Livestock Agriculture	
4. Lack of awareness among technical officers on disaster management	-	Training the officers on disaster management such as preparedness	Provincial Administration	NEMA, MoPN	

CHAPTER 14: ENVIRONMENTAL EDUCATION AND TECHNOLOGIES

14.1 **Status:** The Ministry of Education Science and Technology has developed a Curriculum in both Primary and Secondary Schools on Environmental Conservation. Pupils from class I are taught about their surroundings and the curriculum develops to upper Primary as a Science subject. The topics covered are water, Air and Soil Conservation and are examinable in National Examinations.

- Environmental Education Programs 4K-clubs in Primary Schools, tending of Tree-Nurseries, debate on environmental issues.
- Secondary environmental Programs include Wildlife Clubs, Agriculture as an examinable subject, Presidential Award and Science Congress.
- Some of our Schools have eco-schools and environmental programs and said earlier, our Quality Assurance officers sensitize teachers and pupils to participate in Environmental Conservation.

Table 14(a) Status of Environmental programs in Schools.

No.		No. of Schools	Types of Environmental Programs	Remarks
1.	Primary	245	4K-Clubs, Debating, planting trees and disposal processes Teaching Science.	Virtually all Schools.
2.	Secondary	45	4K-Clubs, Wildlife Club, Agriculture, Geography, Science, Presidential Award, Science Congress.	The Subject is integrated or fused.
3.	Tertiary T.T.C/Technical Institute (deaf).	2	-The Subject Agriculture is taught. The Tech. Institute covers woodwork and Mech. Engineering. -Environment & Wildlife Clubs	

Source; District Education Office, Bondo, 2006

- The environmental topics taught in schools and tertiary institutions relate into actions to conserve the environment:
 - After theory in class they have demonstration on soil conservation, good land use, waste disposals, recycling of material e.g. water and planting of trees.
 - The subject is examinable.
 - Participation in 4K, Wildlife and debating clubs enhance participation.
- The District has non-formal Educational Programs popularly referred to as co-curricular programs.

Key players in non-formal environmental Programs are:

Community Based Organizations (CBOS), Farmer Field Schools, Faith Based Organizations (FBOs), women groups and youth groups. The key players are NEMA, Ministry of Agriculture, Water, Forest, Livestock while donors include SIDA and FAO and Netherlands government

Environmental issues that have been integrated in their non-formal programs are:

- a) Afforestation- many CBOs and individuals are establishing private tree nurseries
- b) Soil Conservation- the community has put in place soil conservation measures such as terracing, building gabions in their farms
- c) Water conservation- most farmers are trapping surface run-off into their farms
- d) Wetlands conservation-informed CBOs are only doing fish farming on the wetlands
- e) Pollution from farm chemicals-some farmers are using farm yard manure and fallow cropping is becoming common
- f) Some Chiefs, CBOs and FBOs are undertaking awareness creation programmes through clean ups and marking the World Environment Day celebrations

Figure 6: Nyandera Green Valley conservation Group's tree nursery, a CBO in Maranda division, many CBOs are incoming little income from selling their products to individuals



Challenges faced with Teaching Environmental Education.

1. Inadequate funds thus poor development of IEC materials. inadequate learning and teaching resources for schools e.g. wind-vanes, Rain-gauge, barometers translating into lack of weather stations, audio and visual equipment as teaching aids
2. Inadequate personnel as well facilitation such as vehicles for office
3. Inadequate provision of reference and basic class Text-books.

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4. Inadequate networking with key environmental players. However there are NGOs that work in the district, very few have interest in environmental activities.

Proposed Intervention in Learning Institutions

1. The Ministry of Education allocation of Funds (FPE).
2. Donation of Textbooks, Journals, Magazines and Audio-Visual teaching Aids to schools.
3. Co-ordination and inter-department consultations.
4. Source for Funds for Environment Clubs.
5. Capacity building for teachers.

Table 14(b) Status of Environmental Programs in Bondo & Proposed Interventions

Environmental programmes	Key players	Challenges	Proposed Interventions
Soil conservation	Agriculture	Financial support	Use of locally available materials Financial support to groups that need special technologies
Private nurseries	Forest	„	Financial support needed
Afforestation/Agrobiodiversity	Forest	„	„

Source: District Forest Office, Bondo, 2006

14.2 Public Awareness and Participation

This is being coordinated by NEMA through the District Environment Committee (DEC) in liaison with line ministries. The key departments include Forest, Agriculture, Water, Fisheries, Livestock and Health, the Councils and NGOs especially Plan Kenya.

The main activities include public barazas in market centres, beaches, public talks in learning institutions, workshops and seminars.

Little has been done to integrate environmental awareness programmes into development planning. The production of the DEAP, which is the first of its kind, is seen as a great step in this planning process with the integration of environmental issues.

NEMA has come with an incentive called environmental awards for local authorities, schools and farmers who have shown exemplary performance in environmental management. Though this is still at its juvenile stages and has not picked up well. In fact it is still done at national level and there is need to award the districts too.

Channels/Awareness creation materials are inadequate and people do not easily consume some information. A few NGOs and NEMA have been able to produce a few posters that cannot sufficiently be used in awareness creation in the entire district.

Key Challenges faced in creating Environmental Awareness

- a) Coordination itself is a challenge because most of the government departments have many on going programs
- b) Inadequate personnel to help preparation of programs and other activities
- c) Inadequate funds coupled with equipment such as computers, vehicles. This reduces the performance of the office
- d) Ignorance among the community. People do not understand the need for environmental conservation, and because of inadequate incentives, few numbers turn out for barazas

Table 14(c) Status of Environmental Awareness & Participation in Bondo

Programs	Key players	Sector	Environmental Benefits	Opportunities	Challenges	Proposed Interventions
Awareness creation on Environment	NEMA, Agriculture Public Health, Forest, Fisheries	Environment	-Afforestation -informed community on EMCA -concern for solid waste management	Collaboration and networking with public and private sectors	Ignorance Inadequate funds & other equipment Inadequate personnel	-more technical staff -facilitation in funding and vehicles, computers -more awareness creation to continue
NALEP-SIDA	Agriculture Livestock	Agriculture	-improving food security	Skilled GoK officers		
FAO-Netherlands Partnership Program (FNPP) on Agro-biodiversity	Agriculture Livestock Fisheries	Agriculture	Improving food security as well as nutritional value Enhancing the existence of endangered food & tree species	Skilled GoK officers Collaboration with NGOs		

Source; District Environment Office, Bondo, 2006

14.3 Technologies

A few existing technologies include;

- a) Use of solar energy for lighting and heating. A few individuals are using solar in their homes for lighting while one hotel is using solar to heat water in the rooms than using electricity which is very costly.. There are talented individuals currently working on wind power devices, though they have not been successful because of inadequate capacity and financial constraints.
- b) Use of energy saving devices such as bulbs in hotels

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98% of the population relies on technologies that are degrading environment or the resources they use are non-renewable. This poses a big challenge to the entire country as the effects of such activities will transgress countrywide or even to some extent worldwide.

Albeit the negative consequences, changing to technologies that conserve the environment remain the biggest hurdle mainly because namely;

- a) The capacity of people to fully develop such technologies is inadequate or lacking. Very few people appreciate for instance Cleaner Production Technology (CPT)
- b) The government has not invested in such technologies that would save as from pollution, global warming e.t.c
- c) Financial constraints is also another issue thus building capacity as well as technical devices are obstacles
- d) Attitude change. Once people are used to a particular way of doing things changing their thinking is never easy. For instance most people who use kerosene for cooking fail to realize that changing to gas has a lot of advantages including the economic costs
- e) Short term focus rather long term focus. A clear case is a person who is not ready to meet the initial costs of installing systems for solar power but ready for electric power without noting that in the long run it would be economically costly to maintain electric power.

Table 14(d) Prioritization of Key Environmental Issues & Proposed Interventions

Prioritized Issues/Challenges	Current Intervention	Proposed Intervention during the plan period (2006-2011)	Responsible Institution	Remarks
Low level of public participation	Awareness creation on need for public participation in environmental conservation	Intensification of the awareness creation. Identification of a better approach for that initiative	NEMA	
Inadequate capacity of DEC		Training DEC on EMCA, their roles, other relevant Acts and general issues on environmental management & conservation	NEMA	
Inadequate funding		Collaboration and networking with stakeholders	NEMA	
Lack of adoption of environment friendly technologies		Government to financially support institutions that have adopted such technologies Capacity building of	NEMA	

		such institutions		
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Source; District Environment Office, Bondo, 2006

CHAPTER 15: ENVIRONMENTAL INFORMATION SYSTEMS

The major gap in accessing environmental information and communication technology is due to lack of knowledge sharing networks at the grass root level, inadequate resources and capacity in collection, analysis, storage and dissemination of information as well as inadequate knowledge among the public

15.1 Types and Sources of Environmental Information

Table 15(a) Information and Data Types in Bondo

Sector	Type of Information	Form (GIS/maps/reports/electronic/books)	Institutions	Access conditions /policy	Users	System of updating
Forest	Forests types, distribution & acreage	Reports Books	District Forest Office	Free access	Government officers, researchers,	Reports updated annually
Agriculture	Extent of Soil erosion & conservation, energy sources, energy saving technologies	Reports Books	District Agriculture Office	”	GoK officers, NGOs, researchers	
Fisheries	Species of fish in the lake, number of fish farms, fish landing sites, month catches from every landing site	Reports	District Fisheries Office	”	”	Both monthly and annually updated
Health	Cases of disease outbreaks,	Reports	District Hospital	”	”	Every time a break is reported
Security	Cases of road accidents	Reports	Police Station	”	”	Anytime an accident is reported
Water	Amount of rainfall, sources of water and catchments in	Reports	Water Resources & Management Authority,	”	”	Annually updated

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	the district		Bondo office			
Livestock	Animal disease outbreaks	Reports	District Livestock & Veterinary offices	”	”	Every time a break out is reported
Education	Schools with Environment, Wildlife and 4K clubs	Reports	District Education Office	”	”	Annually

Source; District Environment Office, Bondo, 2006

15.2 Status of Environmental Information Management Systems

Information sharing/ communication mechanism between Institutions/Lead Agencies, Committees, Taskforces

Access to information in most of the sectors is free. Most of the users of such information easily get them through the various departments in the district. The only shortfall may be method of storage such as reports and books which are at risk of being stolen depending on their sensitivity or demand. Some are stored in the computers.

Most of the institutions have various committees which involve all the stakeholders which provide valuable opportunity for sharing of information. Sharing normally done during meetings, workshops or visit to the offices where information required is available.

Adequacy of Institutional Skills in Information Management

Information management in the district is still poor. Most of the information is in hard copies which are exposed to various risks. A few departments have computers where the soft copies should be stored. This technology faces incompetency in its application among the technical staff. The back up of any report or information is feared to be nonexistent in all the departments.

The district has one District Information and Documentation Centre (DIDC) through UNDP funding, under the management of the District Development Officer. The centre came into operation in June 2006 and is not yet well equipped. The DDO has been mobilizing various government departments and Civil Society Organizations to donate their publications to the centre to help establish a resourceful library. No archive exists in the district.

The district is supplied with two local dailies namely Nation and Standard Newspapers. There is The Link, a regional publication that is published on a quarterly basis.

Constraints in Collection, Dissemination, Co-ordination of Environmental Information & Data

- a) Low institutional skills in collection, documentation and dissemination and management of information. Technical officers have inadequate knowledge on the need and how to manage information.

- b) Poor ICT development. In fact the district which has been operational for eight years just opened such a centre in June. The District Environment Office, a fairly new office lacks a computer that would ensure that information is well managed. The officer depends on computer bureau services where some of the data/information even gets lost.
- c) Poor attitude among technical staff. Very few people have visited the DIDC to acquaint themselves with the centre. Some are not aware of the existence of such a facility in the district.
- d) Lack of funding to create awareness to people as well as to put ICT structures in the district.

Proposed Interventions

- a) Developing strategies to assist in information management. The clients using DIDC should pay some fee to source for more information buying journals, magazines and newly published books that target the community.
- b) Equipping the District Environment Office with a computer and the necessary equipment to facilitate storage of information.

15.3 Indigenous Knowledge

Bondo lies in Nyanza Province and hence the local inhabitants are from the Luo tribe. This is one of the 42 tribes that have strong ties with their cultural and social life that address the wellbeing of their people as well as animals and plants that co-exist with them. Some of these beliefs and practices exist as indigenous knowledge and have been applied since time immemorial to save our lakes, land, forest and animals from overexploitation. Such information is not documented and during the production of this report, they were sourced from old people viz;

- a) Crop rotation-cereals like millet, maize and sorghum were rotated by legumes such as cow peas, green grams and beans.
- b) Shifting cultivation that enhanced soil fertility
- c) Establishment of holy places for worship under big indigenous trees which helped in their conservation-no logging was encouraged. Particular trees especially of medicinal value and rare ones that the community did not know their uses also were never to be cut.
- d) Taboos on kind of birds, animals and fish to be eaten by different clans. Also killing some particular bad and animal species was believed that could lead to curses to the families. Killing a frog was a taboo. This helped in their conservation.
- e) Only adults were allowed to go hunting because they would only kill big animals thus ensuring sustainability. Young boys were meant to believe that killing a big animal would lead curses in their families.
- f) Knowledge of herbs and other resources for treating livestock diseases.
- g) Weather prediction and seasonal changes

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Table 15(b) Types of IK, players and challenges

Sector	Type of IK	Form (oral, artefact music)	Institutions/Individual holding	Access Conditions /policy	Users
Forest	Conservation of trees Medicine plants & herbs	Oral	Medicine men Elderly people	Free	Medicine men researchers
Environment	Weather forecast Biodiversity conservation	Oral Music	Elderly people	„	Farmers, researchers
Agriculture	Soil conservation Value addition to food crops	Oral	Elderly people	„	Farmers Ministry of Agriculture, researchers
Fishing	Fishing gears	Oral	Elderly people	„	Fishermen
Livestock	Medicinal plants	Oral	Medicine men	„	Medicine men, researchers
Culture & Social services	Holy places, trees Food Furniture	Oral Music Artefacts	Elderly people Community	„	Researchers, community members

Source; District Environment Office, Bondo, 2006

15.4 Proposed Interventions

Utilization, documentation, dissemination of IK has been inadequate in the region and the table below summarizes some of the challenges as well as proposed interventions.

Table 15(c) Priority Issues & Interventions

Prioritized Issues/challenges	Current Interventions	Proposed interventions in the plan period (2006-2011)	Responsible Institution	Remarks
Lack of scientific evidence to validate IK		Research to be conducted by research institutions	KARI, KEFRI	
Accuracy in precision & measurement not validated		Research	KEMRI, KARI	
Preference to modern technologies		Training both the public and government institutions to enhance their use	Ministry of Agriculture, Forest Dept	
Few people have the IK, its not documented		Conducting surveys and documentation	Ministry of Agriculture, Forest Dept	
Inadequate support of IK by the GoK		Advocating for their application	CBOs and NGOs that value IK	

CHAPTER 16: ENVIRONMENTAL GOVERNANCE AND INSTITUTIONAL FRAMEWORKS

16.1 Status of Environmental Governance & Institutional Arrangements

The Environmental Management and Coordination Act (EMCA) of 1999 created NEMA as the national environmental watchdog and charged it with the responsibility of environmental conservation and management in Kenya. NEMA has created District Environmental Offices whose key mandate is to co-ordinate and supervise environmental activities in the district. In this sense, the District Environment Officer works with other lead agencies and through the District Environment Committee in discharging the duties.

Bondo is endowed with a number of natural resources among them being Lake Victoria that provides fish for local and export market, sand harvesting and Yala Swamp. These resources have particular environmental concerns and the District Environment Office has been at the centre of addressing these issues.

The district has about 67 landing beaches which are being run by Beach Management Units (BMUs) whose membership includes only the local community (primary stakeholders), this has ensured public participation.

BMUs are some of the institutional structures created by Fisheries Department to oversee activities at the fish landing beaches. The BMUs have also established environmental management committees charged with the ensuring good sanitation at the beaches. Currently, the Ministry of Fisheries and Livestock Development is on the process of legislating the BMUs. Elections of the representatives have been finalized and awareness creation is on going. This is seen as a great step in addressing the use of the resource to provide livelihood and its conservation for future users.

The government departments that collaborate with NEMA (District Environment Office) are Forest, Agriculture, Fisheries, Livestock, Health, Education, Development Office, Water Resources & Management Authority, Local Authorities (Bondo County and Town Councils)

Environmental NGOs do not exist but Plan Kenya has been networking with the District Environment Office and has funded some activities. CBOs that deal with environmental issues are Nyandera Green Valley Conservation Group and Misori Environment and Natural Resources Conservation Group.

Donor organizations in the district

United Nations Development Programme through Local Micro Grants Programme component within the Nile Basin Initiative has funded Nyandera Green Valley Conservation Group.

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European Union is funding Lake Victoria Fisheries Organization (LVFO) to manage fisheries resources of Lake Victoria. LVFO collaborates with Fisheries department, NGOs and CBOs working on fisheries of Lake Victoria.

. EU is also funding proposal through Community Development Trust Fund and Community Environment Facility. The proposals come from the community organizations.

Swedish International Development Agency (SIDA) funding the National Agriculture and Livestock Extension Programme (NALEP). The programme has embraced environmental issues and the District environment Officer is a member of the District Co-ordinating Team (DCT)

Food and Agriculture Organization (FAO) and the government of Netherlands is funding Agro-Biodiversity pilot project. This project involves a number of departments including the Environment Office.

16.2 Regulatory and Management Tools

16(a) Policies which Impact on Environment

Title of policy	Year of formulation	Aspects of environment addressed by policy	Implementing agency(ies)	Coordin-ating mechanisms	Challenges in enforcement	Areas on overlaps & conflicts with EMCA
Forest policy	2005	Tree planting, poverty reduction, soil, water & biodiversity conservation, conservation of catchment areas, forest research, training	Forest Dept	Participatory community forest protection, participatory tree planting, reporting forest pest & diseases to KEFRI, research and dissemination of findings by KEFRI,	-inadequate funds. -poor coordination -political interferences - inadequate law enforcement	<i>Overlaps</i> -research -training -public participation
Diagnosis, treatment & prevention of malaria	2003	Prevention/control of vectors	Ministry of Health	Seasonal calendar Data compiled at Medical Dept	-inadequate funds	

Source; District Forest Office, Bondo, 2006 & District Public Health Office, Bondo, 2006

16.(b) Legislation that Impact on Human Health & Environmental Quality

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Title of legislation	Year of enactment	Aspects of environment addressed by Act	Implementing Agency (ies)	Coordinating mechanisms	Areas on overlaps & conflicts with EMCA
Forest Act	2005	-management of all state forests -management of all provisional forests in collaboration with the owners -protection of forests -promotion of forestry education and training -community participation -prohibited activities in the forest -presidential protection of trees	Forest dept,	Formation of PFM Formation of user groups Education through barazas	
Water Act	2002	-management and conservation water resources protection of water catchments	Water Resources Management Authority	Formation of water users associations and river user associations	
Public Health Act		-sanitation and hygiene	Public Health Dept		
Fisheries Act	1989	-pollution prevention zones -ecological zones where fishing is prohibited	Fisheries Dept	Formation of Beach Management Units (BMUs)	
Agriculture Act		Soil conservation River bank protection	Agriculture Dept		
Pest Control Product Act	1984	Safe use of chemicals Disposal of containers & obsolete chemicals Quality control/persistence	PCPB		
The Local Government Act	1978 and revised in 1998	-control factories/industries/w hich by smoke, chemical fumes, gases, noise, vibration to neighbours -control planning of specific areas e.t.c	Local Authority		

Source, District Forest, Agriculture, Public Health, Fisheries & Water Offices, Bondo, 2006

16.(c) Regulations & by-laws for managing Environmental & Human Health

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Title of Regulations & Gazette Notice Number	Year of Gazettement	Aspects of environment regulated	Implementing Agency (ies)	Coordinating mechanisms	Areas on overlaps & conflicts with EMCA
Fisheries (General) Regulations no. 34	1981	-no trawling in Nyanza Gulf of L. Victoria	Fisheries Dept	Formation of BMUs	
The Local government (Adoptive-by laws) (Building (Amendment) order 1995 L./Notice No. 257 of 7/7/95	1995	Provision of drainage& waste water Sanitary provisions	Local Authority		<i>Overlap</i> Enforcement
Statute Law (Miscellaneous Amendments) act (No. 2 of 2002) in respect of Cap 242 & cap 254 penalties	2002	Enhancing environmental cleanliness	Public health dept	Supervision Prosecution	<i>Overlaps</i> Supervisions Prosecution

Source: District Environment Office, Bondo, 2006

Environmental Tools applied in Bondo

a) Environmental Impact Assessment (EIA) and Environmental Audit (EA)

These are the regulatory tools applied in Dominion Farms Ltd that falls within Bondo and Siaya districts. Other facilities such as the agro based processing industry, filling stations also undertake annual EA to ensure compliance.

Yala Swamp as history will tell has been in existence since time immemorial and falls within Siaya, Bondo and Busia districts.. In 1980s and 90s, the government of Kenya through Lake Basin Development Authority (LBDA) had rice irrigation at the swamp but the project was halted on financial grounds.

In 2003, Dominion Farms Limited, a firm of American origin was given the land by the government of Kenya and lease by Siaya and Bondo County Councils to do rice irrigation for 25 years with a possibility of extension for another 10 years. The company has also asked the government to allow it to undertake fish farming, alternating crop farming, feed milling, fish processing and hydro-electric power generation. All these, through Environmental Impact Assessment as a regulatory tool have been assessed and approved by NEMA. Further, the company must undertake annual environmental audit and submit all reports to NEMA to ensure compliance with EIA requirements.

Due to the complicated nature of activities as well as its sensitivity (farming in the swamp), the District Environment Committee through the District Environment Officer keeps itself

informed of the on going activities at the swamp as well as monitoring through EIA report and Environmental Management Plan.

Dominion has involved the public through Local Stakeholders Forum that meets every month to be briefed on the progress of activities and also the forum serves the local socio-economic interests. Also there is Technical Advisory Committee for the local Members of Parliament, the Councillors and other community representatives that meet quarterly. The third committee is the Technical Environment Committee that includes technical officers from both Siaya and Bondo from line ministries that meet quarterly to provide technical advice to the company.

- c) Inspection of premises such as eating places by Public Health officers
- d) Enforcement of regulations by various departments such as Fisheries, WRMA, Public Health, Local Authority, NEMA e.t.c.

CHAPTER 17: IMPLEMENTATION STRATEGY

17.1 Stakeholders Involvement

The implementation strategy of this DEAP was developed through a stakeholder's workshop which included government departments, agencies, state corporations, civil society organizations, private sectors and District Environment Committee members representing community interests (Appendix illustrates list of attendance during the workshop).

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Table 17 (a) Implementation Matrix

Priority Issues	Object- tive(s)	Output	Activities	Time fram e	Stake holders	Responsi ble Institutio n	Esti mate d cost Yr 1	Est. cost Yr 2	Est. cost Yr 3	Est. cost Yr 4	Est. cost Yr 5	Remar ks
Unplan ned human settleme nt	To improve human settlement s in Bondo & Usenge centres and 74 landing beaches	Well planned human settleme nts in the identifie d sites	1. Revise Bondo Town Development Plan 2. Prepare Regional Physical Development Plan 3. Prepare physical development for all the 74 beaches	1yr 2yrs 2 yrs	DFO, DWO, DPPO, LA, NEMA, MoH	DPPO, LA	840,0 00	840,0 00	840,0 000	840,0 000	540,0 00	
Poor sanitatio n	To improve sanitation status in the 74 beaches	Clean and healthy environ ment	1. construction of latrines to increase coverage from 43% to 60% 2. Construction of sewage system for Bondo and Usenge urban centres 3. Protect and conserve water sources i.e R. Yala and Lake Victoria 4. Extend existing	2yrs 5yrs 5yrs	MoH, LA, WRMA, NEMA, CDF, NGOs	MoH, LA WRMA	20m	25m	30m	35m	40m	

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			water lines from 30% to 50%for Bondo & Usenge centres	5yrs								
Poor solid waste management	To improve solid waste management in the 74 beaches and Usenge & Bondo urban centres	Reduced air and water pollution	1. Provide waste receptors in the two centres by coverage of 70% 2. Create awareness through public barazas and media	5 yrs Cont inuous	MoH, LA, NEMA, community, NGOs	MoH, LA	120,000	120,000	120,000	120,000	120,000	
Encroachment into fragile ecosystems	To protect & conserve Yala & Gomro wetlands	Well conserved ecosystem of the wetlands	1. Enforcement of relevant legislation 2. Rehabilitation of Gomro wetlands 3. Rehabilitation of Yala wetlands	5 yrs 5 yrs	NEMA, Dominion, LA, WRMA, community, MoA, DFO, Prov. Admin. KWS, NGOs	NEMA, WRMA						
Poor/inadequate infrastructure in the 67 beaches	To improve & provide appropriate infrastructural development by	Well developed & maintained infrastructures in the 67 beaches	1. Road maintenance & construction 2. Extend electricity lines 3. extend water lines 4. promoting soil conservation measures (tree planting, check dams, gabions)	3-5 yrs ,, ,, ,,	DWO, KPLC, Water SIBO, LA, Dominion, CDF, NEMA, MoA, KFS	DWO, LA	3m	2.5m	2.5m	2.5m	2.5m	

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	integrating environmental concerns											
Soil erosion & degradation of Abom Hill, Lieta, & Kalandini	To conserve soil in the 3 sites	Productive soils	1. Sensitization & mobilization of the community through barazas 2. Build gabions, construct terraces e.t.c 3. Tree planting 4. Control overstocking	2-5 yrs	DSDO, MoA, NEMA, KFS, community, LA, DWO, Prov. Admin.	MoA	213,960	213,960	213,960	213,960	213,960	
Inappropriate agricultural practices	To promote GAPs in Bondo district	Increased Agricultural production at least by 50%	1. Sensitize the community on GAPs through demos, field days and agric. shows 2. training the community	1-5 yrs	MoA, Dominion, Prov. Admin. NGOs, DLPO, NEMA	MoA	74,056	74,056	74,056	74,056	74,056	
Low production from livestock enterprise	To improve livestock husbandry & increase production in the district	Increased output per unit within a production cycle	1. Community sensitization & mobilization through training & public barazas 2. Demos, field days & agric shows	1-5 yrs	DLPO DFO MoA, DSDO, KFS, NGOs, CBOs, Prov. Admin.	DLPO	600,000	700,000	800,000	700,000	600,000	
Decline	To	1.	1. Removal of bad	3-5	DFO,	DFO	8.8m	8.1m	6.5m	5.6m	5.3m	

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ng fish stock & catches in L. Victoria	improve fish stock & catches in the lake	Increase income among the fisherfolk by 5% per year 2. Reduced reliance on the lake as a source of income	fishing gears 2. Limit number of fishermen/fishing boats 3. Promotion of aquaculture 4. Regular surveillance of breeding grounds 5. Sensitization through barazas 6. Training the community on IGAs	yrs	KMFRI, LVFO, LVBC, Prov. Admin. NEMA, LBDA, Moi University, LA, NGOs, community							
Degradation of water catchment areas a. river bank degradation	To prevent river bank erosion along R. Yala by 30m wide x 30 km length	Well conserved river banks	1. Sensitization & mobilization of the neighbouring communities through barazas 2. Demarcation & pegging of the river banks 3. Planting of water friendly trees & plants along the banks 4. Training on soil conservation practices (conservation farming) by river bank to	3-5 yrs ” ” ”	Communities, WRMA, MoA, NEMA, DSDO, KFS, Prov. Admin, LA, Dominion	WRMA	750,000	880,000	1.02 m	1.15 m	1.3m	

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			riparian communities.									
b. encroachment into wetlands	To protect & conserve Yala for bio-diversity conservation	Well protected & conserved Yala swamp	1. sensitization & sensitization of riparian communities through baraza 2. Demarcation of wetlands 3. Planting of water friendly tree species in such areas	5 yrs ,, ,,	WRMA, Dominion, MoA, NEMA, LA, DSDO, community, Prov Admin.	WRMA	750,000	980,000	1.095m	1.27m	1.6m	
c. Water along the lakeshores of Victoria	To improve water quality along the lake shores	Improved water quality	1. Awareness creation through barazas to the riparian communities 2. Proper enforcement & monitoring of laws/rules & regulations 3. carrying out periodic water quality analysis	5 yrs	Community, WRMA, MoA, NEMA, DSDO, LA, Dominion,	WRMA	600,000	705,000	820,000	1.02m	1.145m	
Degraded hilltops	To improve & conserve forest cover of 30 ha of Ramogi, Usenge & Abiero hills	The 3 hilltops improved & conserved	1. Sensitization & mobilization of neighbourhood communities through barazas 2. training the communities 3. production of tree seedlings through tree nursery establishment 4. Extensive tree	5 yrs	KFS, NEMA, LA, Prov Admin, WRMA, Research institutions, Community	KFS	790,000	750,000	690,000	600,000	455,000	

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			planting									
Inadequate timber products in the district	To increase tree cover of fast growing tree spp for poles & timber production by 10%	1. Well established commercial woodlots in farms 2. availability of poles /timber in the local market	1. Sensitization & mobilization of the community through barazas 2. carry out baseline survey on tree spp & their utilization 3. Production of seedlings through nursery establishment 4. promoting improved tree seedlings through purchase and demos 5. carry out farm plantation	5yrs	KFS, NEMA, LA, Prov Admin, WRMA, Research institutions, Community	KFS	1.6	1.55m	1.55m	1.5m	1.5m	
Low cover by indigenous commercial tree spp	To promote & conserve commercial indigenous tree spp & medicinal plants	Indigenous tree spp in farm lands & trust lands	1. Promoting commercial indigenous tree spp through training of the communities 2. carry out spp inventory 3. carry out baseline survey on utilization of the tree spp	5 yrs	KFS, NEMA, LA, Prov Admin, WRMA, Research institutions, Community	KFS	450,000	290,000	270,000	70,000	70,000	
Decline in flora & fauna species	To promote & conserve both flora	Increase biodiversity	1. Sensitization & mobilization of the community through barazas & training	5yrs	KFS, community, Prov Admin, LA, DSDO,	KFS	785,000	460,000	340,000	245,000	325,000	

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through human settlement	& fauna in the district		2. Taking inventory of the existing flora & fauna spp 3. Re-legislation of trust lands (forest reserves) to KFS for appropriate management 4. Reintroduction of relevant spp		NEMA, KWS, MoA, Fisheries, DLPO							
Diminishing wood fuel	To Increase the district forest cover	Increased forest cover	1. Tree nursery establishment, 2. Community and resource mobilization and formation of steering committees 3. Tree planting.	5 yrs	Community opinion leaders, relevant GoK agencies, FBOs, CBOs and NGOs.	KFS	415,000	445,000	420,000	380,000	360,000	
	To reduce the current wood fuel consumption by 30% in the plan period	Reduced wood fuel consumption	1. Advocacy 2. capacity build the local community on energy saving jikos 3 M&E on the construction of energy jikos and usage	Continuous	Community opinion leaders, relevant GoK agencies, FBOs, CBOs and NGOs.	MoE	1.67m	1.67m	1.67m	1.67m	1.67m	

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	To increase the number of households using alternative energy sources by 1%.	Increase consumption of renewable energy	1. Promotion of wind, solar, biogas, hydropower use through training	5 yrs	Community, opinion leaders relevant GoK agencies, FBOs, CBOs and NGOs.	MoE	2.7m	2.7m	2.7m	1.62m	0.3m	
	To Provide electricity to 67 fish-landing sites by the plan period.	67 landing sites provided with electricity.	1. Community mobilization 2. survey and design 3. registration of consumers 4. Construction and provision of power supply-	5 yrs	Community opinion leaders, relevant GoK agencies, FBOs, CBOs and NGOs.	MoE	2m	6m	6m	6m	1.6m	
Non-compliance to EMCA and other regulations by Bondo Fishmeal	Bondo Fish factory and any potential factory to conform to environmental standards and regulations	Bondo Fish Meal factory and upcoming ones conform to environmental standards and	1. Conduct Environmental audits 2. Ensure compliance to regulations on Water Quality & Waste Management 3. conduct health survey on the factory'	3 yrs	The firm itself, NEMA, MoH, LA, DFO	NEMA	0.6m	0.5m	0.3m	0.3m	0.3m	

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		regulations										
Inadequate infrastructure development(road networks,communications,water distribution)	1. to increase road coverage and access by 50% during the plan period 2. To increase telephone network coverage to 50% during the plan period. 3. To increase access to clean and safe water by 20 %.	Improved road network, communication and water distribution	1. Community mobilization -Stakeholders workshops -Formation of WAMASCOS Survey and design of roads-	5yrs	Community, political leaders, relevant GoK agencies, FBOs, CBOs and NGOs.	DWO, SIBO, Min of Information & Communication	40m	40m	40m	40m	40m	
Insufficient Provision	To provide relevant information	Informed industries	1. advocacy 2. stakeholders meeting	3 yrs	NEMA, Min Trade & Industries &	NEMA	1.2m	0.8m	0.8m			

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n of relevant information on regulations, laws for industrial development in the district	n to the industries in the district	s/investors			Services							
Lack of Ecotourism development	To integrate ecosystem and tourism in the district development in planning period	Ecotourism integrated into the district development plan	1. stakeholder meetings 2. Inventory of tourist attraction sites and potentials 3. DDC approval	3 yrs	Ministry of Tourism, NEMA MPND, KWS	Ministry of Tourism & MPND	158,000	100,000	30,000			
Lack of control of the water hyacinth along the affected	To clear the water hyacinth along the affected beaches during the planning	Water hyacinth cleared from the beaches	1. community mobilization and sensitization 2. formation of steering committees	3 yrs	Community NEMA, Prov. Admin. DFO KARI	NEMA	5m	3.5m	3.5m			

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beaches.	period											
Poor marketing of tourism attraction sites in the district	To promote tourism in the district	Tourism promoted	1. identify tourist sites 2. hold a stakeholders meeting 3. use the media to promote local tourism	5 yrs	Community, LA, Min of Tourism and chamber of commerce	Min of Tourism	210,000	200,000	200,000	50,000	50,000	
Unsustainable sand harvesting	To promote sustainable sand harvesting in Kamariga, Wichlum and Ludhi beaches	Controlled sand harvesting in the 3 areas	1. sensitize & mobilize sand harvesting communities 2. Implementation of sand harvesting guidelines 3. Rehabilitation of Kamariga beach	3yrs	Community, transporters, LA, NEMA, Prov. Admin. DWO, construction firms	NEMA	0.8m	1.7m	.3m			
Inadequate capacity of DEC in environmental management	1. to empower DEC in environmental management	1. Trained DEC members 2. Meetings conducted 3. Infrastructural	1. Training DEC 2. Facilitating DEC operations 3. Construction of office & procurement of office equipment	Continuous 3 yrs	NEMA, Prov. Admin. DEC members, DWO, DPPO, NGOs	NEMA	1m	2.8m	4.3m	0.3m	0.3m	

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		facilities (office building, office equipment & motor vehicle) in place for the DEO										
Low public awareness & participation in the district	To enhance public awareness & participation on environmental activities district wide	Active public participation in environmental activities	1. sensitization & mobilization through barazas 2. Promoting awareness through networking with local media	Continuous	NEMA, local media, DEC members, Prov. Admin. DSDO, LA	NEMA	400,000	200,000	2000,000	200,000	100,000	
Uncoordinated implementation of ESL in primary schools	To monitor the implementation of ESL in primary schools in	Coordinated implementation of ESL	School visits and meetings with stakeholders	Continuous	NEMA, MoE (Education, Nature Kenya	MoE	0.4m	0.3m	0.3m	0.2m	0.2m	

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	Bondo											
Inadequate ICT capacity for environmental information management	To build capacity of line ministries and DEC members on information management	Trained officers & DEC members	1. Training on ICT	1yr	Line Ministries, NEMA, DEC members, NGOs	NEMA	1.5m					
Inadequate integration of environmental issues in the DMC	To integrate environmental issues in the DMC activities	Environmental issues integrated in DMC activities	1. Training DMC members on environmental issues 2. Field visits & documentation of disaster prone areas	Continuous	Prov. Admin DMC NEMA	Prov. Admin.	0.7m	0.7m	0.6m	0.4m	0.2m	

17.2 Key Priority Issues

The key priority issues are;

1. Promoting on farm tree planting for energy provision
2. Promoting sustainable sand harvesting
3. Efficient waste management (solid and liquid)
4. Controlled soil erosion and land degradation
5. Controlled pollution from Bondo fishmeal
6. Planned human settlements
7. Eradication of illegal fishing gears
8. Capacity building for the District Environment Committee
9. Hilltop afforestation

APPENDIX 1: List of Contributors

Name	Institution/Organization
Mr. Alex Muthyoi	District Development Office
Mr. Alfred Abayo	District Fisheries Office
Mr. Andrew O. Owuor	County Council of Bondo
Mr. Asha O. Okang'a	District Public Health Office
Mr. Christopher Ohango	District Social Services Office
Mr. John Asudi	District Statistics Office
Mr. John Lumumba	District Irrigation Office
Mr. K. B. Nyatwongi	Physical Planning, Siaya & Bondo
Mr. Morris R.O. Omollo	District Forest Office
Mr. Nelson Sifuna	District Education Office
Mr. Nobby Macharia	Trade Officer, Kisumu
Mr. Peter Okeyo	Water Resources Management Authority, Bondo
Mr. Phillip Tingaa	District Agriculture Office
Mr. Samuel Okumu	District Livestock Office
Mrs Ann Anam	Odhuro Primary School
Ms Ann Macharia	District Agriculture Office

APPENDIX 2: LANDING BEACHES IN BONDO DISTRICT

LANDING BEACHES IN BONDO DISTRICT
Rarieda Division
Beach –Ralayo
Beach –Kokach
Beach-Kowange
Madiany Division
Beach – Kombe
Beach – Kogoye
Beach – Aram
Beach-Nyangoye
Beach-Madundu
Beach – Obenge
Beach – Wikwang
Beach-Kamariga
Beach – Kamin Oningo
Beach – Magare Island
Beach – Osindo
Beach – Gudwa
Beach – Kunya
Beach – Kopiata/Kasiri
Beach – Kogonga
Beach – Misori
Beach – Luanda Kotieno
Odongo
Beach – Mayange
Wi-Nyamanga
Usigu Division
Beach – Usenge
Beach – Nyenye Misori
Beach – Uhanya
Beach – Uwaria
Beach – Oele
Beach – Nyaudenge
Beach – Nambo
Beach – Mahanga
Beach- Sika
Beach – Nyenye
Beach – Mitundu
Beach – Ugambe

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Beach – Honge
Beach – Luanda Disi
Beach – Goye
Beach-Kuoyo
Beach – Magare
Beach – Waka Waka
Beach – Siungu
Beach –Anyanga
Beach – Otono
Nyang’oma Division
Beach – Ndeda
Beach – Ludhi
Beach – Sifu
Beach – Sirongo
Beach – Uyawu
Beach – Riskis Kogwari
Beach – Oyamo Island
Beach – Nyamnwa
Beach – Wichlum/Uhendo
Beach – Saga Island
Beach – Olago
Beach – Liunda
Beach – Port South ‘B’
Beach- Warianda
Beach – Kamumbo
Beach – Wagusu
Kochilo
Ulanda
Awandu
Maranda Division
Beach – Utonga
Obondo Mumbo
Wi-Nyamanga

APPENDIX 3: LIST OF PARTICIPANTS

Bondo DEAP Stakeholders Workshop held at Rozala Motel between 7th-8th March 2007

No	Name	Institution/Organization
1.	Dr. Samson Wasao	UNDP/Poverty Environment Initiative
2	Joseph M. Katumo	Ministry of Environment & Natural Resources
3	Godfrey Mwangi	NEMA Headquarters
4	Patrick Muturi	Ministry of Planning & National Development/PEI
5	Alfred Abayo	Fisheries Dept.
6	Christopher Ohango	Social Services
7	Otieno Maurice	Plan, Kenya-Bondo Development Area
8	Nelson .O. Juma	DEC member
9	Jane Obwago	Town Council of Bondo
10	Ruth A. Agot	DEC member
11	George Aganyo	Agriculture
12	Austin Ngesa	Livestock
13	Peter Okeyo	WRMA
14	Vincent Onyango Ogutu	Youth Enterprise Scheme- Kenya, Bondo Chapter
15	Asha O. Okang'a	Ministry of Health
16	George Ouma	Radio Lake Victoria
17	Morris R.O. Omollo	Forest Dept.
18	Andrew O. Owuor	County Council of Bondo
19	Tom Odhenge	Education
20	Hezron O. Ochiel	Standard Newspaper
21	K. B. Nyatwongi	Physical Planning
22	Wesley. K. Cheruiyot	District Officer I
23	John A. Ojwang	DEC member
24	Alex Muthyoi	Ministry of Planning
25.	Cassim Bilali	DEC member
26.	Elly Oyier Oliech	Constituency Development Fund, Rarieda const.
27.	Agnes Kola	Action Aid Kenya, Bondo
28	Selelah Okoth	NEMA, Bondo
29.	Lilian Awino	DEC member
30.	Fred Akello	NEMA, Bondo (Intern)
31.	Ignatius Otieno	NEMA, Bondo (Intern)