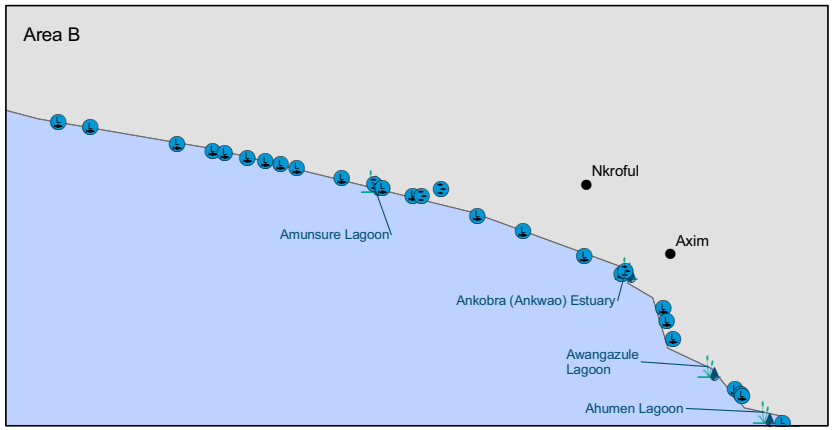
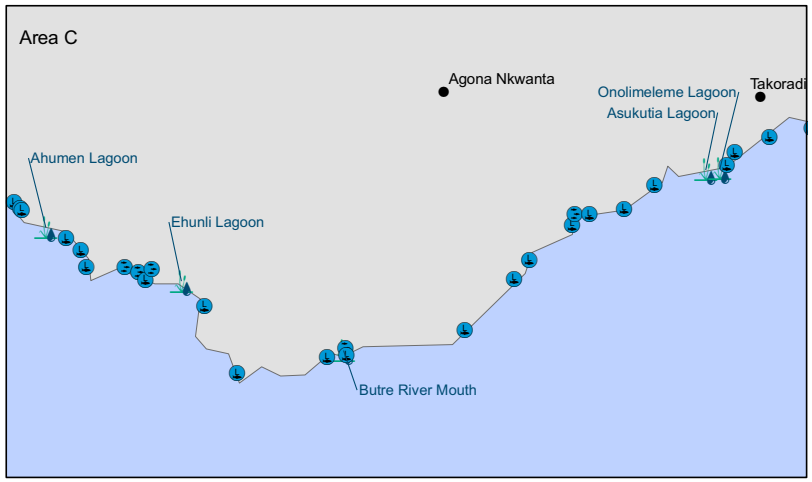
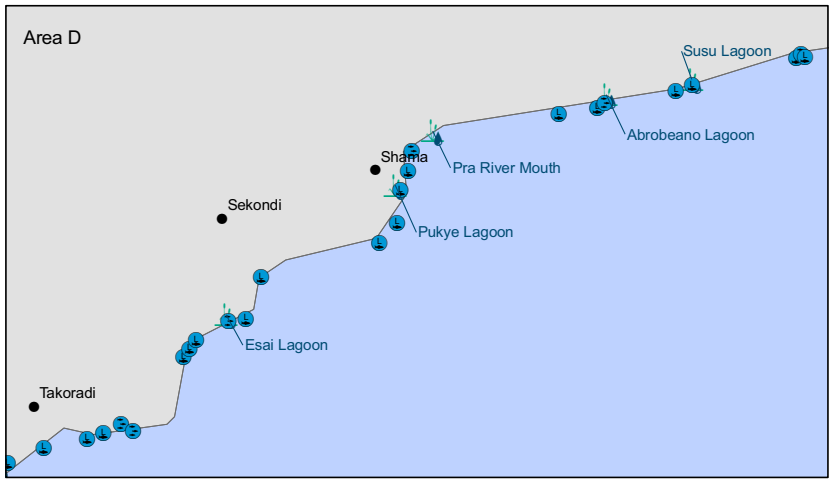
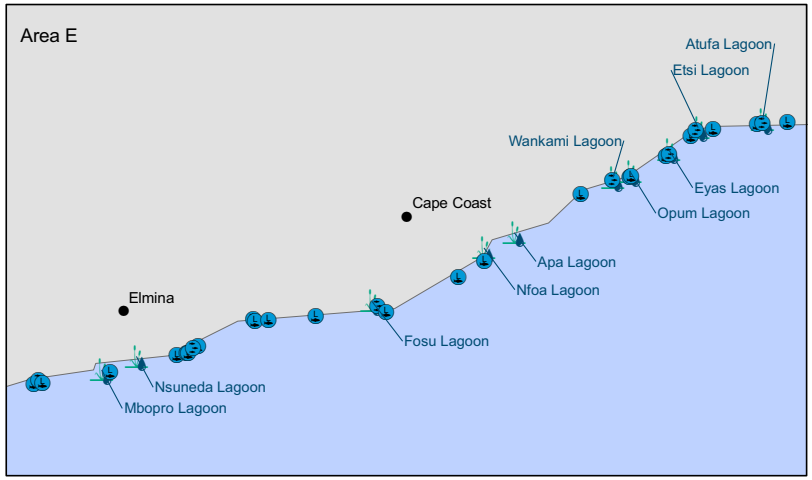
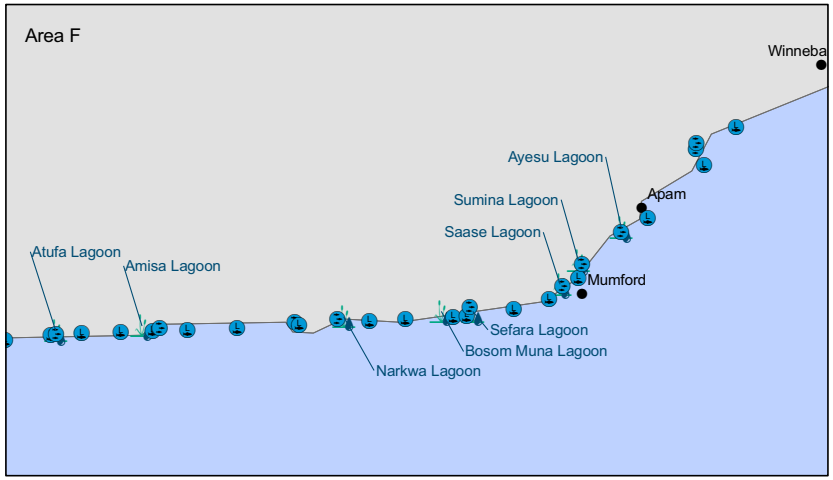




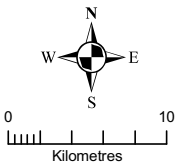


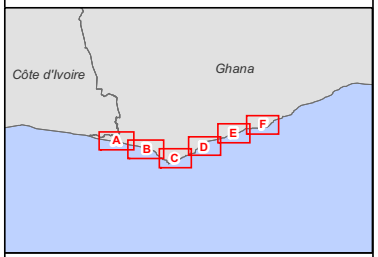




KEY:

- Nursery Areas
- Landing Site
- Lagoon, River Mouth or Estuary
- Cities and Towns





TITLE:

Figure 4.41
Fish Landing Sites located along the Western Coastline of Ghana

CLIENT:	SIZE:
Tullow Ghana	A4

DATE: 06/08/2009	CHECKED: MI	PROJECT: 0096867
DRAWN: CO	APPROVED: MI	SCALE: As Scale Bar

DRAWING: EnvSnstvs_NursAreasLandSites.mxd | REV: 0

ERM
Norloch House
36 King's Stables Road
Edinburgh, EH1 2EU
Tel: 0131 478 6000
Fax: 0131 487 3636

SOURCE: EPA Ghana: Environmental Sensitivity Map for Coastal Areas of Ghana, Volume 1, Atlas
PROJECTION: GCS WGS 1984

File: 0096867\Ghana_CO_MXD\MXD\Env\Snstvs_NursAreasLandSites.mxd

Storage and Processing Facilities

There are 170 cold stores with a total capacity of about 140,000 tonnes spread throughout the country for storage of fish and meat products. Over 75 percent of these cold stores are located in major fishing towns, notably in Accra, Tema, Cape Coast, Elmina, Sekondi and Takoradi. A few of the cold stores have facilities also for ice production, for example Sekondi and Tema.

There are three fish processing plants and fish canneries in Ghana; namely Pioneer Food Cannery (PFC), Ghana Agro-Food Company (GAFCO) and MYIOC Food Cannery all located at Tema. The companies only process tuna and are currently processing approximately 180 tonnes of tuna per day. PFC accounts for over 90 percent of this total.

Boatbuilding, Repairs and Maintenance

There are two boatbuilding companies located in Tema and Sekondi that construct inshore vessels (Tema Boatyards Corporation and Sekondi Boatyards Corporation). These companies were Government owned until the early 1990s when they were privatised. Due to the high cost of materials and the low demand for fishing vessels the current capacity for boatbuilding is low.

These two boatyards also provide dry-docking and repair facilities for inshore vessels. The Tema Shipyard and Drydock Corporation also provides dry-docking and repair facilities for all categories of fishing vessels. A number of engineering and fabrication workshops are also located in Tema, which is the hub of the fishing industry in Ghana. A number of private companies in Tema, Accra and Takoradi operate engineering workshops and a foundry for repairs.

Presently, fish production, processing, storage, marketing, trading, boat building and maintenance services provision are dominated by the private sector which employs approximately 500,000 people. Fisheries Associations in Ghana represent the interest of fishers, fish processors and fish exporters. Some of these associations have national representation while others are more regional or local. The principal associations are:

- Ghana Inshore Fisheries Association.
- Ghana Tuna Association.
- Ghana National Canoe Fishermen Council.

The National Fisheries Association of Ghana (NAFAG) is the umbrella association for these associations.

4.3.4 Industrial Fleets

The major industrial fleets operating in Ghana are as follows.

- small scale;
  - artisanal fishing (in lagoons and estuaries);
  - artisanal fishing (in open water from canoes);
- semi-industrial;
  - inshore trawling;
  - shrimping;
- industrial;
  - offshore trawling or distant water fleet; and
  - tuna fishing with poles and lines, and purse seines.

Artisanal Fishery

The artisanal sector of the industry accounts for over 70 percent of annual marine fish production and dominates the Ghanaian fishing industry (Mensah and Koranteng, 1988). There are over 8,000 canoes, of which approximately half are motorised by low powered out-board engines. These vessels use a wide variety of fishing gear and target a number of different species. Over one hundred thousand fishermen are engaged in this sector. This sector provides both employment in coastal communities and a relatively cheap but rich source of protein. Although most fishermen operate in coastal waters and do not venture out into the deeper offshore waters, there are no available maps of traditional fishing grounds.

The main types of fishing gears used by the artisanal fishermen are encircling nets, beach seines, purse seines, set nets, hook and line and drift gill nets. Each gear has very different geographical distributions along the coast and the dominance of any particular gear type in an area is influenced by the target species sought. For example, the beach seine is widely used in the Volta Region, particularly around the mouth of the Volta River and other estuarine areas, to exploit juvenile fish. These areas are nursery grounds for several important fish species such as shrimp, mullet, carangid and cassava croaker. Purse seine nets are prominent in the Greater Accra and Central regions where small pelagics (particularly sardinellas and horse mackerel) are heavily exploited, whilst drift gill nets and set-nets are the most common gear used in the Western and Central regions.

The most important fish species caught by the Ghanaian artisanal fleet are the round sardinella (*Sardinella aurita*), flat sardinella (*Sardinella maderensis*), the anchovy (*Engraulis encrasicolus*), chub mackerel (*Scomber japonicus*), sparids (*Pagellus bellottii* and *Sparus caeruleostictus*) and big-eye grunt (*Brachydeuterus auritus*). There are a wide range of small pelagic species in the Gulf of Guinea and they are the most abundant marine resources exploited by fishing fleets operating in Ghanaian waters. The four species of the highest economic value are the round sardinella, flat sardinella, anchovy and chub mackerel. Annually, these four species account for over 80 percent of the total landings

of small pelagic resources and the potential annual yield of these species is estimated to be in the region of 200,000 tonnes.

The bulk of small pelagic species are most abundant between July and September. In the past, fishing for sardinellas was localised. As the Ghanaian population increased the demand for fish became greater leading to increased development. The use of paddles and sails for the canoes led to seine nets and outboard motors to this meet this increased demand.

Seasonal increases in the abundance of small pelagic fish species are influenced by low sea-surface temperatures (less than 23^{o} C), high salinities (less than 35 ppt), and the movement of cold water, rich in nutrients, into surface layers of the water column. The cold, deep, nutrient rich water replaces the warm layers on the surface due to a break in the thermocline caused by wind forces acting on the sea surface. The eggs and larvae of the sardinellas are found all year round with peaks of spawning during the upwelling periods (Mensah and Koranteng 1988). Seasonal migrations towards the shore occur between the months of July and October (*Section 4.2.7*) where spawning adults (that continue to feed) become vulnerable to artisanal fishing gear. The small pelagic fish are mainly caught by encircling gear such as purse seine nets and beach seines.

Over the past two decades from 1986, the annual landings of the round sardinella fluctuated widely from a peak catch of 126,000 tonnes in 1992 to 22,000 tonnes in 2008. During the same period the anchovy catch has fallen by almost 50 percent from 88,000 tonnes in 1987 to 42,500 in 2008. The trend is that of a general decline from 1992 to 2008 for the both sardinella and anchovies. During the same time span, the catch levels of the other two key small pelagics, flat sardinella and the chub mackerel, have been under 20,000 tonnes, with the exception of the 1987, 2004 and 2006 catches of the latter. Catches of the chub mackerel have been lower on the average and have shown consistent decline from the year 2000. See *Figure 4.42* for annual catches of small pelagics from 1986 to 2008.

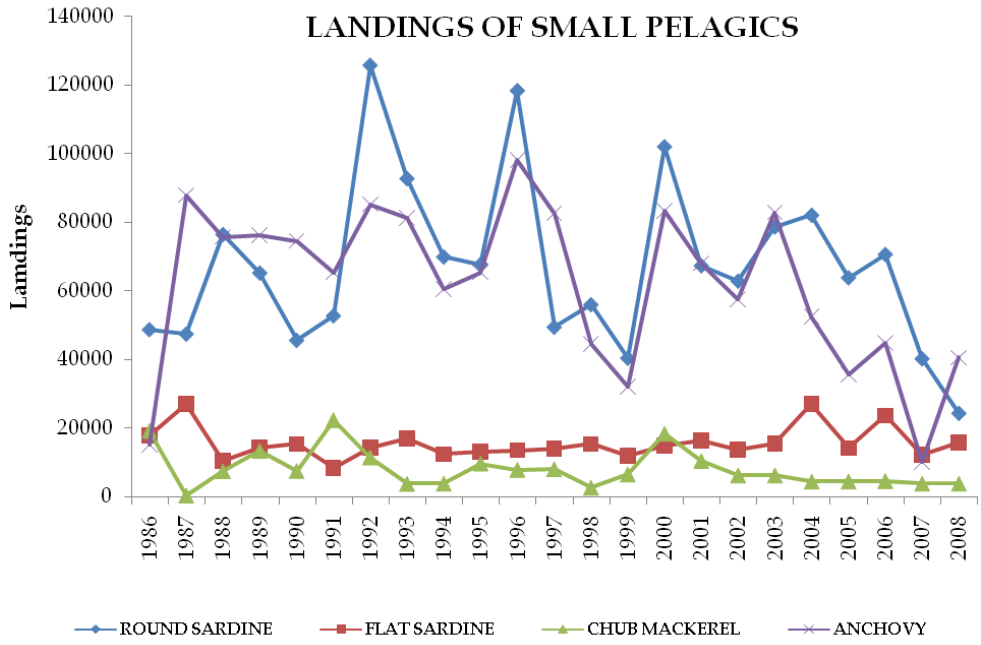
The Inshore Fishery

There are approximately 350 semi-industrial vessels presently involved in this sector of the fishing industry. According to Bernacsek (1986), the inshore fishery consists of medium to large sized motorised vessels of between 8 and 30 metres. The majority of these semi-industrial vessels are wooden, built locally, and fitted with inboard engines of up to 400 hp. Most vessels carry both purse seine and trawl gear. Between July and September vessels use their purse seine gear to target pelagic species whose number increase with the onset of the upwelling during this period.

Trawling is carried out for the remaining part of the year when pelagic resources are less numerous. Most purse seine nets measure 400-800 m long, are 40-70 m deep and have a mesh size of approximately 25-40 mm. Bottom

trawl gear has a mesh of 40 mm at the end of the net (codend), 45 m head rope and 40 m foot rope.

Figure 4.42 Annual Landings of Small Pelagic Fish Species in Tonnes



Source: MFRD 2008.

The dimensions of trawl gear vary considerably, depending on a range of factors including the amount of fish available and the main species targeted. Harbour facilities for large trawlers are available at two landing sites located along the coastline; Tema and Takoradi while mooring for smaller trawlers is available at Winneba, Apam, Mumford, Elmina and Sekondi. The most important fish species caught are the sardinellas, chub mackerel, sparids, big-eye grunt, cassava croaker (*Pseudotolithus senegalensis*), lesser African threadfin (*Galeoides decadactylus*) and common cuttlefish (*Sepia officinalis*). The inshore pelagic fishery targets species in the relatively shallow coastal waters and do not venture into deeper offshore waters.

Offshore Trawling/Distant Water Fleet

Fishermen of the industrial sector use imported steel fishing vessels. The fleet consists of trawlers, shrimpers and tuna boats. Fishing trips may last up to one month. The industrial trawlers are usually over 35 m in length and have engines of over 600 hp. There are over 70 industrial trawlers operating in Ghana comprising 12 single and pair trawlers, 40 shrimpers and the rest are made up of set nets. The most important target species are the sparids, carangids (*Caranx rhonchus*), cuttlefish, West African goatfish (*Pseudupeneus prayensis*) and cassava croaker.

The industrial shrimpers are normally up to 30 m in length with engines up to 400 hp. Shrimp vessels operate in designated areas within Ghanaian waters between Shama and Axim. Seventeen shrimp vessels operated in 1994 but in

2007 the numbers were reduced to 2 vessels. In a normal trip, significant proportions of bycatch comprising small inshore fishes such as Atlantic bumper (*Chloroscombus chrysurus*) and big-eye grunt are taken.

The depths of the Jubilee Field benthic environment (up to depths of 1100 m to 1700 m) make assessment of benthic fish assemblages by trawling difficult. The shallower continental shelf and slope areas (below 200 m depth) are more accessible to trawling vessels and as a result more is known about the fish assemblages in these areas. Studies have shown that the composition and abundance of demersal fish fauna of the western Gulf of Guinea change with depth (William, 1968). In addition, environmental factors such as nature of the bottom (i.e. sediment type), total organic matter content, temperature, salinity and dissolved oxygen have been shown to determine the distribution of the different demersal fish species within the Gulf of Guinea (Longhurst and Pauly, 1987; Koranteng, 2001).

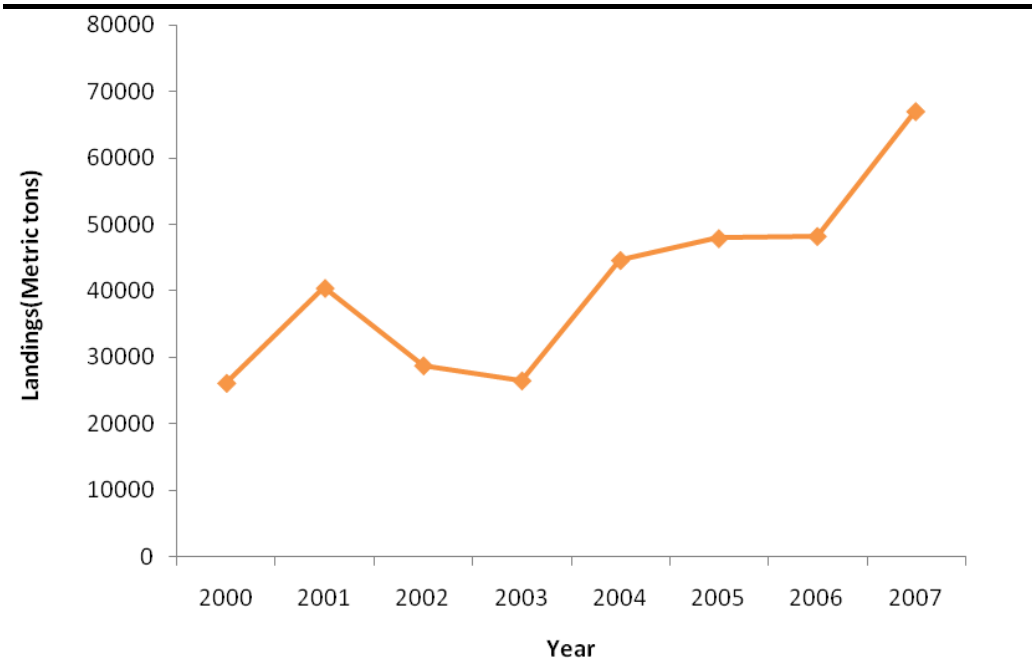
A survey undertaken as part of the West African Gas Pipeline Ghana EIA (WAPC, 2004) reported a total of 115 commercially exploited marine species from 62 families along the Ghanaian coast at depths between 10 m – 70 m on the east and central parts of Ghana. The species comprised 16 species of crustaceans, 4 species of molluscs, 4 species of invertebrates and 84 species of fish. The depth and nature of the seabed were considered to be the most important factors in the differences in catch composition and weight. Catch rates increased with depth with the most productive fishing found at 45 m. The dominant species in the catches were the common cuttlefish and the channel flounder (*Syacium micrurum*). The channel flounder, Guinea flathead (*Grammoplites gruveli*), African wide-eyed flounder (*Bothus podas*), common cuttlefish, West African goatfish, and piper gurnard (*Trigla Iyra*) were recorded in the catches taken from the majority of survey stations within Ghanaian waters. Other species include Steaked gurnard (*Chelidonichthys lastoviza*) and Ghanaian comber (*Serranus accraensis*). The composition of species in the hauls varied from each station.

The most important demersal fish species are of the families Sparidae (Porgies, mainly *Pagellus bellottii*, *Pagrus caeruleostictus*, *Dentex canariensis*, *Dentex gibbosus*, *Dentex angolensis* and *Dentex congoensis*), Haemulidae (Grunts, *Pomadasys incisus*, *P. jubelini* and *Brachydeuterus auritus*), Sciaenidae (Croakers or drums, eg *Pseudotolithus senegalensis*), Mullidae (Goatfishes, *Pseudupeneus prayensis*) Lutjanidae (Snappers, *Lutjanus fulgens* and *L. goreensis*) Serranidae (Groupers, *Epinephelus aeneus*) Polynemidae (Threadfins, *Galeoides decadactylus*) and Lethrinidae (Emperors, *Lethrinus atlanticus*).

The potential yield of demersal fishes on Ghana's continental shelf is estimated to be up to 55,000 tonnes annually. The total annual demersal landings by all fleets from 2000-2007 is shown in *Figure 4.43*. The trend indicates a progressive increase in demersal landings since 2000 and show catches in the region of 70,000 tonnes in 2007, above the estimated total yield of demersal fish species of approximately 50,000 tonnes annually. This data

represents the total annual catches and does not indicate fishing effort which will influence the total catches.

Figure 4.43 Total Annual Demersal Landings by all Fleets from 2000-2007



Source: FAO 2007

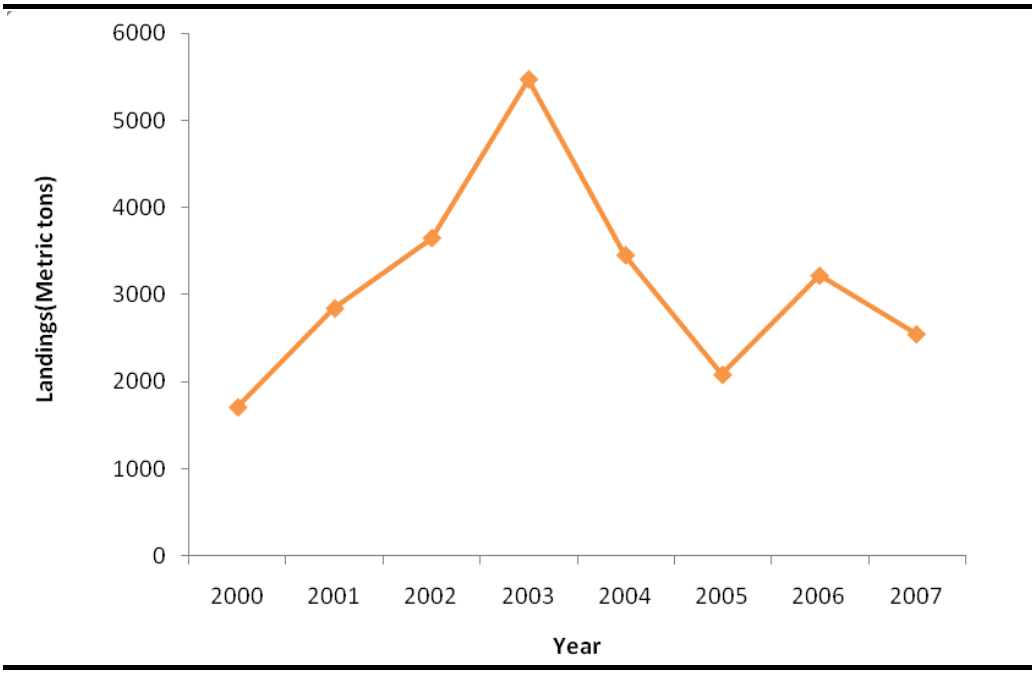
Information regarding the demersal resources of the Gulf of Guinea (CECAF Area 34 – approximately from Sierra Leone to Benin) is generally limited. Williams (1968) and Longhurst (1969) indicated that the demersal fish within the tropical West African region exhibit strong depth stratification. This stratification is partly due to substrate and food preference, and partly due to temperature preferences. In general, two distinct groups or demersal assemblages are noted, namely the Sciaenid and Sparid communities. The Sciaenid communities (eg *Galeoides, Pseudotolithus, Pomadasys*) inhabit soft to muddy bottoms and are usually above the base of the thermocline. The Sparid (eg *Epinephelus, Lutjanus, Pagrus, Dentex, Pagellus, Pseudupeneus, Decapterus*) communities are found on hard bottoms, above the base of the thermocline at approximately 50 m, while below the thermocline they inhabit a much wider variety of habitats.

According to the FAO (1995), fishing pressure on demersals in this region has been concentrated on the inshore zone and mainly targets juveniles. This has the potential to be detrimental to the spawning potential of most species.

Catches of molluscs and crustaceans are dominated by cuttle-fish, squid (*Loligo vulgaris*), octopus (*Octopus vulgaris*) lobster (*Panulirus regius*) and shrimps (mainly *Penaeus notialis*, *Penaeus kerathurus*, *Parapeneopsis atlantica* and *Parapenaeus longistrostris*). These species contribute to demersal catches and constitute another important component of the demersal resources targeted in Ghanaian waters. Of these cuttlefish are the most important. However,

annual landings of cuttlefish have shown a general decline since 2003 (*Figure 4.44*). This data represents the total annual catches and does not indicate fishing effort which will influence the total catches.

Figure 4.44 Total Annual Landings of Cuttlefish 2000-2007



Source: FAO 2007

Tuna Fleet

Yellowfin tuna are fished throughout tropical Atlantic Ocean, between 45° N and 40° S with surface gear (purse seine, live bait and hand-line), and with longlines. Seine and live bait fisheries in the tropical Eastern Atlantic are the most important in terms of catch and effort. Bigeye tuna are distributed in the Eastern Atlantic from Ireland to South Africa and are mainly caught using longline, bait boat and purse seine gear. Longlines account for the greatest proportion of the total catch (around 65 percent of the total Atlantic catch). Skipjack tuna are mostly caught with surface gear all over the Atlantic, chiefly by baitboat and purse seine vessels, although there are small numbers of chance longline catches.

Purse seine fishing began in the Eastern Atlantic in the early 1960s and saw rapid growth in the 1970s, during which fishing gradually expanded to the high seas, especially at the equator. From 1991, purse seine fleets fishing in the Eastern Atlantic, including Ghana began to alternate traditional yellowfin and skipjack fishing with catches from schools associated with artificial floating objects. In the Eastern Atlantic Ocean the purse seine fishery dominates and in 2004 accounted for 64.5 percent of total catches in the Eastern Atlantic.

The second most important fishery is baitboat fishing, the principal target being bigeye tuna, in which the rod-and-line vessel acts as bait, locating and

fishing a school which may be composed of bigeye, yellowfin and skipjack. From the 1980s through to 2004, catches in the Eastern Atlantic exhibited no particular trend, fluctuating between 48,000 tonnes in 1988 and 24,000 tonnes in 2004, with an annual average of 37,000 tonnes for the period.

The tuna and billfish species that occur in Ghanaian waters are part of a wider population found throughout the Atlantic Ocean. Tuna baitboats are the main exploiters of tuna in Ghanaian waters, using live anchovy and other small pelagics as the main bait for their operations. In addition, the use of bamboo rafts as Fish Aggregating Devices (FADs) is common. However this practice is currently banned during a Moratorium period introduced by ICCAT to examine the impacts of FAD fishing on tuna populations.

Baitboats and purse seiners exploit the tuna resources off the EEZ of Ghana. The total number of vessels in operation in 2007 is 37, comprised of 25 baitboats, 10 purse seiners and 2 longliners. The pole and line operators are the main exploiters of tuna in Ghanaian waters, using bait in their fishing operations. In addition, numerous bamboo rafts (fitted with radio buoys) are used as fish aggregating devices (FADs) to enhance the capture of tuna species. These vessels mainly target offshore populations of skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacores*) and bigeye (*Thunnus obesus*) tuna species. Some billfish, in particular swordfish (*Xiphias gladius*) and blue marlin (*Makaira nigricans*) are also caught.

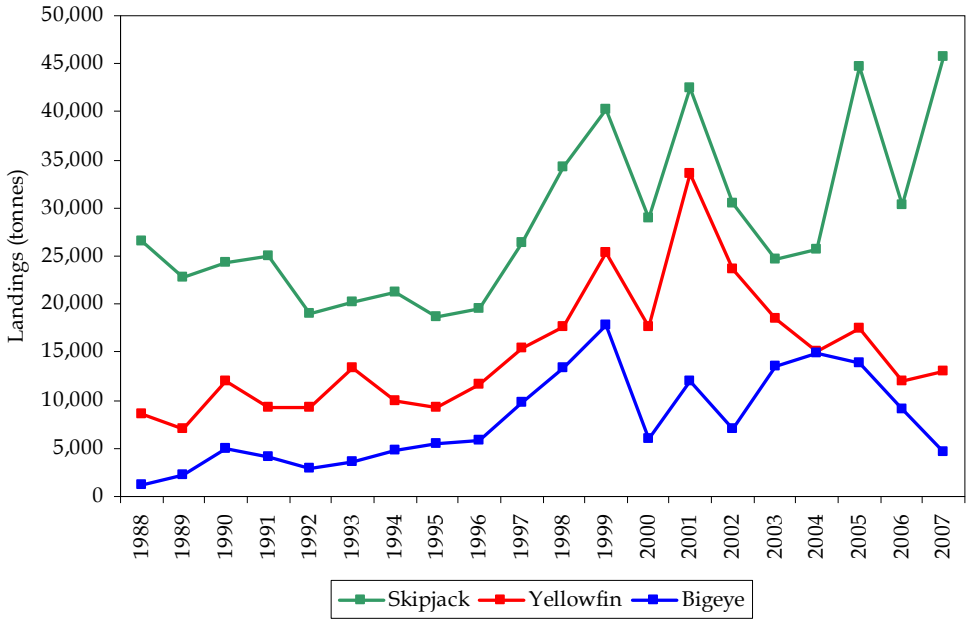
In Ghanaian waters fishing is chiefly carried out by purse seine and bait boat vessels although a number of longline vessels targeting bigeye tuna, may also operate. In the early 1990s, techniques such as the use of bird radar to find birds feeding on fish shoals and the use of FADs(1) were employed to enhance the capture of targeted tuna species (Kwei and Bannerman, 1993). In the bait boat fishery (which uses poles and line to catch tuna) anchovies (*Engraulis encrasicolus*) are used as bait. The purse seine fishery was reintroduced in 1995 and increased to a maximum of 10 vessels in 2006. These vessels are the largest operating in Ghanaian waters with a GRT(2) between 500 and 1000 tonnes. Purse seine vessels target yellowfin, bigeye and skipjack tuna and collaborate extensively with baitboats to target tuna and often share their catch at sea.

Management of the tuna and billfish populations in the Atlantic ocean is coordinated by the International Commission for the Conservation of Atlantic Tunas (ICCAT). ICCAT carry out regular population assessments of exploited populations within their convention area and assess the status of the entire Atlantic populations of each species. The most recent population assessments indicate that yellowfin and bigeye tuna resources in the Atlantic are being fully exploited and any increase in catches would be detrimental to the fish populations. The status of skipjack tuna populations is currently unknown.

(1) Fish Aggregation Devices are constructed of debris and floating objects and are placed on the waters surface to attract large shoals of tuna. The FAD and the tuna shoal underneath are then surrounded by a net and the entire shoal caught.
(2) Gross Registered Tonnage

Total annual landings of the three species are between 60,000 and 80,000 tonnes. Catches of skipjack reached an historic high at 45,709 tonnes in 2007, followed by yellowfin at 12,955 tonnes and bigeye at 4,634 tonnes. Since 2001 there have been steady declines in catches, although in 2005 catches of skipjack showed a degree of variability, while catches of yellowfin and bigeye have continued to decline (*Figure 4.45*).

Figure 4.45 Catches of Tuna in Ghanaian EEZ from 1988 to 2007



Source: ICCAT 2007

There are three main gear types operated in Ghanaian waters to target tuna. These are purse seine, bait boat (pole and line) and longline gears. The largest proportion of effort is expended by the bait boat vessels followed by purse seine vessels. Longlines are relatively rare in Ghanaian waters. The level of effort in targeting different species is very different for each tuna species. Baitboat catches are greatest for skipjack, followed by purse seine vessels. For yellowfin the highest catches are taken by purse seine vessels, followed by bait boat vessels. Longline vessel catches are relatively low in comparison. Bigeye catches are mostly taken by bait boat and purse seine vessels. Longline vessels take some catches but are highest outside the Ghanaian EEZ. Other minor tuna-like species especially the little tunny (*Euthynnus alletaratus*) are also exploited by the fleets.

Figure 4.46 shows the distribution of catches in the Gulf of Guinea between 1998 and 2007 in relation to the Jubilee field project area. Tuna are caught throughout the survey area with the highest catches generally offshore and south of the Jubilee field. The Gulf of Guinea is one of the most productive tuna fishing areas in the Atlantic Ocean due to the presence of spawning areas for yellowfin and bigeye tuna, high densities of prey and water temperatures that suit the tuna species. Concentrations of spawning adults are found within the equatorial zone of the Gulf of Guinea, and occur throughout the

Atlantic Ocean. Spawning takes place all year round, although yellowfin tuna tend to show peaks in spawning between January and April. Growth rates have been described as relatively slow initially but increase when the juvenile fish join the adult population. These tuna species do not have specific spawning grounds that have been identified within the Gulf of Guinea.

Shark Fishing

Some shark fishing has been reported during consultation but little data is available. The exploitation of shark fins has become a widespread business in Ghana. The sharks are caught using driftnet (locally known as Anifa-anifa or Nifa-nifa) and species mostly comprise of silky shark (*Carcharhinus falsiformis*), black tip shark (*Carcharhinus limbatus*), oceanic whitetip shark (*Carcharhinus longimanus*), sandbar shark (*Carcharhinus plumbeus*) and night shark (*Carcharhinus signatus*). In Ghana, shark fishing is a year-round operation with a peak season in October and December (Ghana, Post Harvest Fisheries Overview, 2003). Since shark fishing is conducted by different types of vessels, including artisanal, semi industrial and industrial) and as many as 150,000 fishermen might be involved in it (Mensah, *et al*, 2006).

4.3.5 Fish Biomass

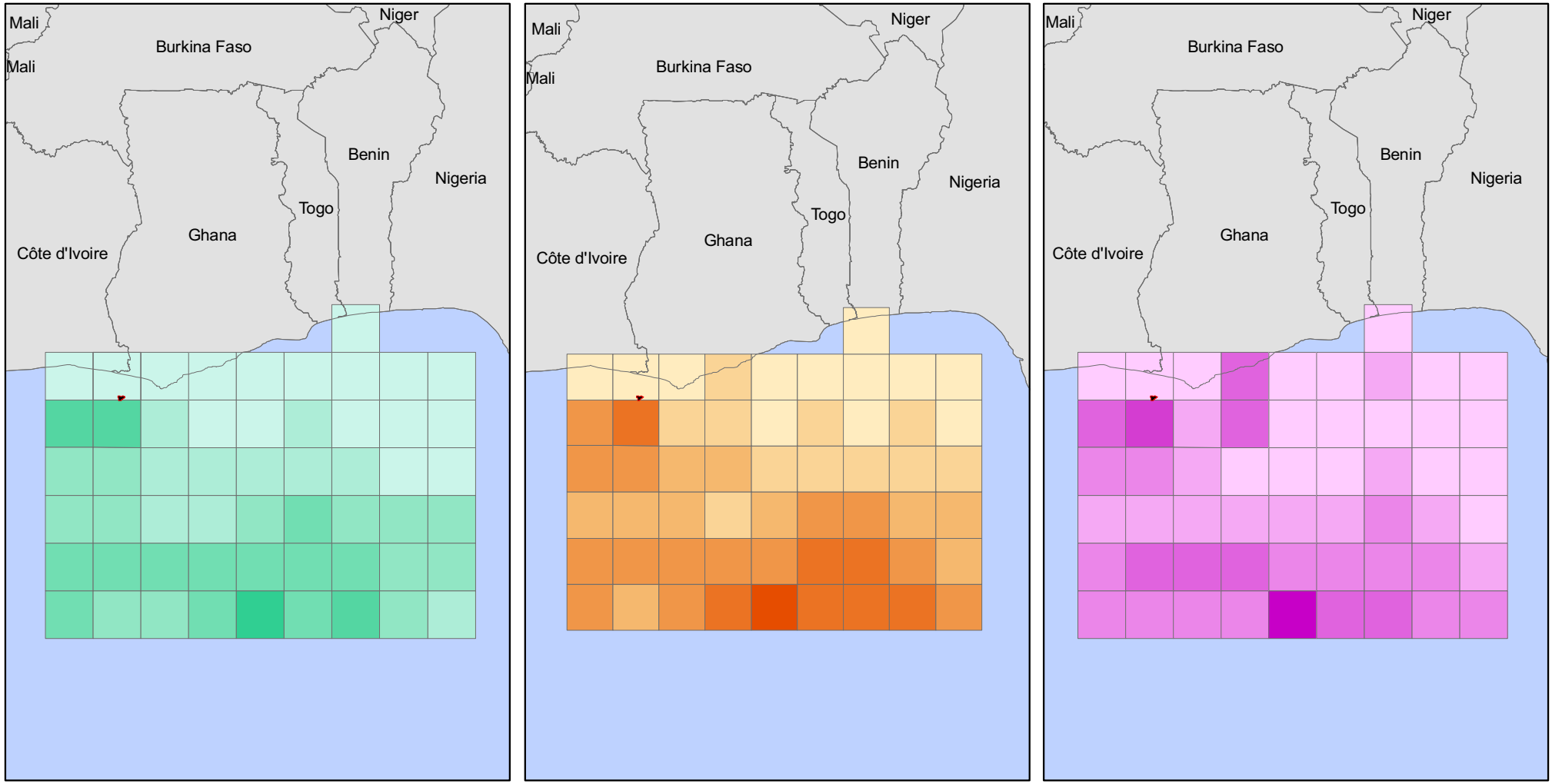
Table 4.17 shows the biomass estimates of small pelagic species from Fridtjof Nansen surveys conducted in Ghanaian waters from 1981 to 2006 and presents the estimated biomass of the main pelagic fish species groups (NANSEN/FAO 2005, 2006). The potential yield of the four most important pelagic species (round sardinella, flat sardinella chub mackerel and anchovy) was estimated to be 200,000 tonnes per annum.

Table 4.17 Pelagic I (Sardinellas and Anchovies) and Pelagic II (Carangids, Scombrids Hairtails etc) Biomass Estimates from Fridtjof Nansen Surveys

Year	Biomass Pelagic I (Tonnes)	Biomass Pelagic II (Tonnes)
1981	40 000	57,000
1989	41 000	50,000
1999	40,000	50,000
2000	56,500	61,000
2002	73,000	52,000
2004	68,000	37,000
2005	54,000	46,000
2006	57,000	37,000

Source: Fridtjof Nansen/FAO 2550/2006

Table 4.18 shows the biomass estimates for demersal species from the Fridtjof Nansen surveys between 1999 and 2006. In recent years (2002 – 2006), the total demersal biomass has been stable at around 17,000 tonnes, despite increased pressure from fishing activities.



KEY:

Jubilee Field Unit Area

Skipjack
- 2 - 320
- 321 - 900
- 901 - 1500
- 1501 - 2600
- 2601 - 5300
- >5301

Bigeye
- 0 - 50
- 51 - 150
- 151 - 300
- 301 - 600
- 601 - 1200
- >1201

Yellowfin
- 0 - 700
- 701 - 2100
- 2101 - 4100
- 4101 - 5500
- 5501 - 16000
- >16001

N
W E
S

0 250
Kilometres

CLIENT: Tullow Ghana Ltd.

SIZE: A4

ERM
Norloch House
36 King's Stables Road
Edinburgh, EH1 2EU
Tel: 0131 478 6000
Fax: 0131 487 3636

ERM

SOURCE: ©Collins World Atlas
PROJECTION: GCS WGS 1984

TITLE: Figure 4.46
Total (Tonnes) Aggregate Catch (1997 - 2007) of Skipjack, Bigeye and Yellowfin Tuna in the Gulf of Guinea (1 x 1 degree grid)

DATE: 06/08/2009 | CHECKED: MI | PROJECT: 0096867
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REV: 0

File: 0096867\Ghana_CO_MI\MAPS\TunaCatch.mxd

Table 4.18 ***Biomass Estimates (tonnes) of Valuable Demersal Species and some other groups from bottom trawls (0 – 100 m)***

Group / Species	1999	2001	2002	2004	2005	2006
Seabreams	8,478	13,346	14,181	16,187	15,690	15,166
Grunts	1,431	4,397	1,168	326	2,261	140
Croakers	125	1,046	850	286	821	664
Groupers	557	1,921	254	220	235	674
Snappers	151	5,322	422	200	413	1,366
Sub-total demersals	**10,743**	**26,032**	**16,876**	**17,219**	**19,420**	**18,010**
Bigeye grunt	70,314	9,120	21,182	13,866	27,896	7,296
Carangids	6,860	47,054	45,332	7,405	19,226	11,831
Barracudas	1,084	915	1,999	1,589	2,201	2,554
Cephalopods	4,400	4,900	2,000	2,600	2,181	3,208
Totals	**93,401**	**88,021**	**86,732**	**42,679**	**70,924**	**42,899**

Source: Fridtjof Nansen 2006

Mean catch rates of demersal species during these surveys are quite similar. In 1999 the catch rate was higher due to one large catch of big-eye grunt. Pelagic fish had similar high mean catch rates in 2000 and 2002, but much lower in other years, especially in 1999. The biomass of these species is very much determined by the strength of the upwelling and a number of other environmental factors. Thus, the biomass estimates of the small pelagics are generally more variable than those of the demersal species. From the 2008 survey the biomass distribution indicates that the largest proportion of valuable demersal species is estimated to be higher in the outer shelf of the coast (ie between 51 and 100 m water depth) (*Table 4.19).*

Table 4.19 ***Biomass Estimates (tonnes) of Important Species/Groups on the Shelf, in 2008 by Depth.***

Group/species	0-30 m	31-50 m	51-100m	Total
Seabreams	551	1,631	12,985	15,166
Grunts	99	41	0	140
Croakers	127	41	495	664
Groupers	14	248	413	674
Snappers	155	0	1,210	1,366
Sub-total demersals	**946**	**1,961**	**15,103**	**18,010**
Bigeye grunt	4,208	1,878	1,210	7,296
Carangids	1,878	3,488	6,465	11,831
Barracudas	890	1,032	633	2,554
Cephalopods	99	991	2,118	3,208
Totals	**8,021**	**9,350**	**25,529**	**42,899**

Source: Fridtjof Nansen 2008

Shrimps are caught by all fleets (except tuna fishing vessels), mainly from shallow waters and close to estuaries in the Western shelf of Ghana. The shrimp species available in Ghanaian waters are *Penaeus notialis* and *Parapeneopsis atlanticus* with a potential yield of up to 800 tonnes.

Stock assessments for the three tuna species in Ghanaian waters are currently in development and only the biomass for yellowfin is currently reported (*Table 4.20*). However, estimates of the catches that will sustain the population are currently available and indicate catch levels should not increase above current levels. For yellowfin there are some indications that catch levels have decreased in recent years. In addition the stocks for yellowfin and bigeye are currently considered to be fully exploited and increases in catch levels would adversely affect the whole population. The stock status of skipjack is currently unknown as skipjack tuna stocks worldwide show very peculiar characteristics which makes assessment of populations a very complex task.

Table 4.20 Stock Status of Eastern Atlantic Tuna Species

Species	Current ICCAT Biomass estimate	Maximum Sustainable Yield	Stock Status	FAO Recommendation	IUCN Red list status
Yellowfin	~370,000 tonnes	130,000 to 146,000 tonnes	Fully exploited	Sustained catch increases not possible	Lower Risk
Skipjack	Unavailable	143,000 to 156,000 tonnes	Not known	Catch increases should not be considered until stock status is known	
Bigeye	Unavailable	90,000 - 93,000 tonnes	Fully exploited	Sustained catch increases not possible	Vulnerable

Source: ICCAT 2009

Generally these problems are associated with indexes essential for stock assessment and are intrinsic to the biology of this species and the fisheries that target them, particularly in the Atlantic. The following problems have been indicated by the ICCAT scientific committee (ICCAT 1999).

- Recruitment is continuous in time, but heterogeneous in space and time so that no singular cohort can easily be identified (Cayre and Farrugio 1986).

- Growth is variable in space, depending on the region considered so that fish of the same age will exhibit different sizes (Bard and Antoine 1986).

- Continuous movements of fish do occur at many different geographical scales, so that the different regions interact differently with each other depending on the type of movement of fish (size-dependent diffusion and migration).

- Many different fleets with heterogeneous and changing catchabilities are exploiting the same population; for many of these fisheries, skipjack tuna is often a secondary or by-catch species, depending on the relative prices, and on the availability of other target species. Thus it is problematic to estimate the effective fishing effort for skipjack in the eastern Atlantic.

4.3.6 Commercially Important Shellfish

A variety of invertebrate species known from the wider/coastal study area are:

- cuttle-fish (*Sepia officinalis*),
- squid (*Loligo vulgaris*),
- octopus (*Octopus vulgaris*)
- lobster (*Panulirus regius*) and
- deep-sea rose prawn (*Parapenaeus longistrostris*); and
- shrimps (mainly *Penaeus notialis*, *Penaeus kerathurus*, *Parapeneopsis atlantica*).

Of these species the highest catches are of the cuttlefish species, followed by the crustaceans, particularly decapod crustaceans such as *Panulirus regius*. Prawns are of lesser importance and catches in recent years have shown some decline. However, these species are important food items for a number of fish species and other predators within the Ghanaian coastal and marine ecosystem.

The cuttlefish species, the common cuttlefish (*Sepia officinalis*) and the pink cuttlefish (*Sepia orbignyana*), are both caught in Ghanaian waters and are both eastern Atlantic species. However, the latter is restricted to a distribution from 17 °S to 55 °N within the Eastern Atlantic, whereas the distribution of *S. officinalis* is more widespread; from the Baltic and North Seas to South Africa.

The pink cuttlefish (*S. orbignyana*) is a free swimming species occurring over muddy and detritus-rich continental shelf and slope areas between 50 and 450 m depth, but is most abundant between 80 and 150 m. No onshore spawning migrations have been reported. Spawning occurs at temperatures of 13 to 16°C from early summer to autumn. Mature males, aged 6 or 7 months, carry about 100 spermatophores(1); females of 9 or 10 months, some 400 eggs. Egg diameter increases with the size of the females. The eggs (7 to 8.5 mm diameter) are laid in clusters of 30 to 40 and attached to sponges on muddy bottoms.

Sepia officinalis is a demersal, shallow coast waters species occurring predominantly on sandy to muddy bottoms from the coastline to about 200 m depth, but most abundant in the upper 100 m. Larger individuals are encountered in the deeper part of the range. Seasonal migrations (mainly vertical) have been shown to occur in all stocks. Spawning occurs in shallow waters, throughout the year, with peaks at water temperatures from 13 to 15°C off Senegal and on the Sahara Banks between January and April (primarily large adults); there is a second minor spawning peak of medium and small-sized individuals in late summer and early autumn.

(1) A spermatophore is a capsule or mass created by males of various animal species, containing sperm cells and transferred to the female during copulation.

Eggs measure from 8 to 10 mm in diameter and are attached in grape-like clusters to seaweeds, debris, shells and other substrates. They hatch after 30 to 90 days depending on temperature (21.5 to 15 °C, respectively). Larvae hatched in early summer from the spring brood usually participate in the autumn spawning of the following year, while those from the autumn brood spawn in spring in their second year of life. Thus, the two cycles alternate. Males predominate in the adult phase because of very large post spawning mortality among large females.

Prey items consist of small molluscs, crabs, shrimps, other cuttlefishes, and juvenile demersal fishes. Predators of common cuttlefish include sharks, sparids and other demersal fishes and cuttlefishes.

The deep-sea rose prawn (*Parapenaeus longirostris*) is found on the continental shelf and upper slope, between 50 and 400 m depth over sandy seabeds. The size of individuals increases with depth. The rose prawn is essentially an Atlantic Ocean prawn, found from Portugal to Angola in the east, and from Massachusetts, USA, to French Guiana in the west. The rose prawn spawns throughout the year, with peaks in July and December. Eggs are demersal and the larvae are planktonic. The larvae enter the post-larval phase at a length of 12 mm. Juveniles are concentrated between depths of 50 and 70 m, where recruitment into the adult population takes place.

The shrimp species, southern pink shrimp (*Penaeus notialis*), Caramote prawn (*Penaeus kerathurus*) and Guinea shrimp (*Parapenaeopsis atlantica*) constitute the majority of the shrimp catch in Ghanaian waters. They are generally associated with sandy and muddy bottoms on the continental shelf, southern pink shrimp to a depth of 100 m, Caramot prawn to 75 m, and Guinea shrimp to 60 m. Each species is found throughout the west Coast of Africa. The biology of these species, in comparison to the rose prawn, is less well understood and little is know of their spawning grounds or seasons.

4.4 SOCIO-ECONOMIC BASELINE

This section presents information on the key socio-economic issues and activities relevant to the project. It includes an overview of administrative structures, demographics, economics, health and education. Infrastructure and services are provided at a national level and relevant socio-economic information for the Western Region and the coastal Districts is provided.

It should be noted that detailed information on a number of these issues was limited and some sources were a number of years old, such as data from the 2000 Population and Housing Census and medium-term District development plans for the period 2006-2009. More recent sources of information include District water and sanitation development plans, District health annual reports and sub-metro community business and development plans for Sekondi Takoradi Metropolis (STM). This information was augmented with specific socio-economic data at the District level that was obtained through interviews with District level planning officials. Details of these meetings are reported in *Annex A*.

The next population census is scheduled to start in March 2010 and most Districts will update their medium-term development plans for the next planning period in the same year. More up to date socio-economic data will be available when the census results and updated development plans become available.

4.4.1 *Administrative Structures*

The government administration in Ghana's is made up of ten administrative regions subdivided into 170 metropolitan, municipal and Districts areas, each with an administrative Assembly comprised of a combination of appointed and elected officials. Each is area has a District Chief Executives (DCEs) who heads the local Assembly. The DCE is nominated by the President of the country and is confirmed by the Assembly through balloting.

The local government system under the Local Government Act 462 of 1993 is made up of the Regional Coordinating Council (RCC), four-tier Metropolitan and three-tier Municipal/District Assemblies with Urban/Town/Area/Zonal Councils Unit Committees. The RCC is the apex of the local government system. There are ten RCCs corresponding to ten regions in the country. The Council is made up of the Regional Minister as Chairman and his deputies, the Presiding Member of each District Assembly and the District Chief Executive of each District in the Region, two Chiefs from the Regional House of Chiefs, Regional Coordinating Director and the Regional Heads of decentralised ministries.

The RCCs under Act 462 are non-executive bodies responsible for monitoring, coordinating and evaluating the performance of the District Assemblies and any Agency of the central Government. The RCC is an administrative/ coordinating system rather than a political and policy making body.

The Paramount Chiefs are the traditional heads of the people and carry great influence. They are the traditional custodians of the land. This position is recognised by the administrative structures. The chiefs are not supposed to be politically aligned as they are responsible for supporting every member of the community. The chiefs are influential and need to understand government policies and decisions.

The Western Region (the Region closest to the project) currently comprises 14 Districts, two Municipalities, and one Metropolis, the latter being STM. The Districts and their District capitals are presented in *Table 4.21* and *Figure 4.47*. In 2005, a number of new Districts were created, including Shama District and Ellembele District. There is very little published data available for these newly created Districts and most of the information presented here for the new Districts is derived from the interviews with District officials.

Table 4.21 Districts and Capitals of the Western Region

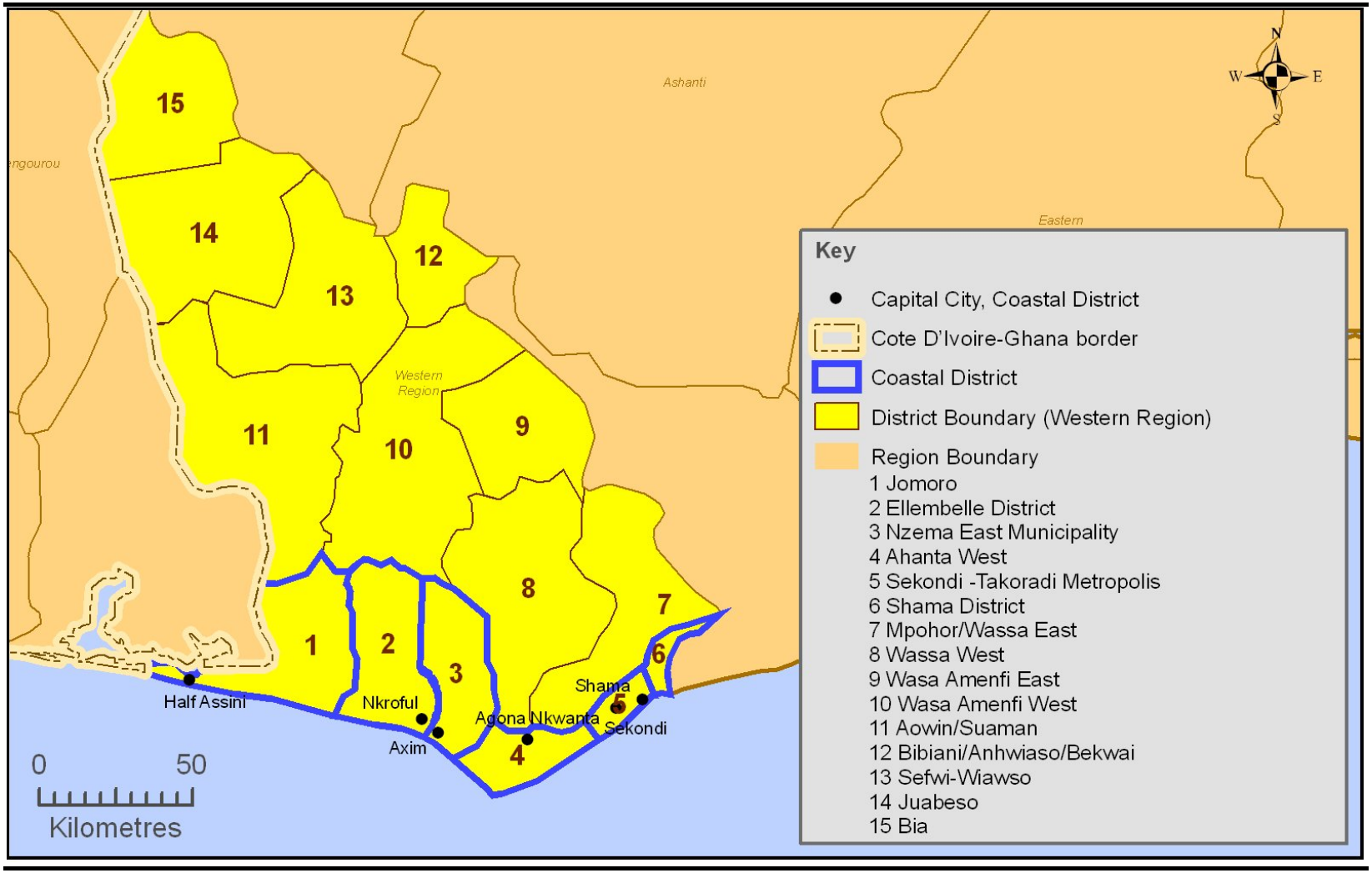
Districts	Administration Type	Capitals
Jomoro *	District	Half Assini
Nzema East *	Municipality	Axim
Shama *	District	Shama
Sekondi-Takoradi *	Metropolis	Sekondi
Ellembele *	District	Nkroful
Ahanta West *	District	Agona Nkwanta
Tarkwa Nsuaem (Wassa West)	Municipality	Tarkwa
Wassa Amenfi West	District	Asankragua
Aowin-Suaman	District	Enchi
Juabeso	District	Juabeso
Sefwi-Wiawso	District	Sefwi-Wiawso
Bibiani-Anhwiaso-Bekwai	District	Bibiani
Bia	District	Essam
Wassa Amenfi East	District	Wassa Akropong
Pristea Huni Valley	District	Bogoso
Sefwi Akontombra	District	Sefwi Akontombra
Mpohor-Wassa-East	District	Daboase

* Coastal Districts that form part of this study
Source: 2000 Population and Housing Census Western Region

4.4.2 Civil Society

Civil society is composed of voluntary civic and social organisations and institutions. These include Non-Governmental Organisations (NGOs), Community Based Organisations (CBOs) and other civic and social groupings. In the Western Region a large number of development NGOs, community groups, women's organisations, faith-based organisations, professional associations, self-help groups, social movements, business associations, coalitions and advocacy groups are active. The Western Region Network of NGOs (WERENGO) is a network of NGOs that operate in the Western Region of Ghana. In STM, there are approximately 68 registered civic and social organisations.

Figure 4.47 Map showing the Coastal Districts and Capitals of the Western Region



A list of some of the active organisations and groups in the Western Region that we met during the consultation process or attended the Public Hearings are provided in *Table 4.22*.

Table 4.22 Examples of NGOs and Civic Groups Operational in the Western Region

NGOs	Other Civic Groups
Community Agriculture Project	Fish mongers Association
Conservation Foundation	Heardressers Association
Co-operation for the Development of Emerging Countries	Traders association
Friends of the Earth	Fishermen Association
Friends of the Nation	Cocoa Farmers Association
Ricerca e Cooperazione	Seamstress Association
Wassa Communities Affected by Mining	Hairdressers Association
Word Alive Missions Association	Student groups
World Vision International	Youth groups

* This list is not comprehensive and lists those organisations and groups in the Western Region that were met during consultations or attended Public Hearings.

4.4.3 Demographics

Population Structure and Distribution

The population of Ghana is approximately 23 million (July 2008 estimate) with the Western Region having approximately 2.5 million people (Ministry of Health, Ghana, 2008). The Western Region has average population density of 80.5 persons per square kilometre, making it the sixth densest region out of the ten regions in the country, and has experienced accelerated population growth over the years. Between 1960 and 1970, the population grew by 23 percent, between 1970 and 1984 it more than doubled, while between 1984 and 2000, it increased by 66 percent.

Population growth from 1960-1970 and 1984-2000 is similar to national figures; however, population growth between 1970 and 1984 was high in comparison with the national average. This rapidly increasing growth in population may be attributable to several factors, including an increase in the birth rate and a decrease in the mortality rate over the period. The growth would also have been linked to in-migration resulting from increased economic activity, particularly between 1984 and 2000, when the region experienced a boom in both the mining and the cocoa industries (Population and Housing Census, 2000).

Over one third (36 percent) of the Western Region is urbanised with the remaining 64 percent being rural.

Demographic Characteristics of the Six Coastal Districts

An overview of the population characteristics for the six coastal Districts that form part of the study is provided below.

- **Jomoro District.** The District has a total population of 111,348 and a population growth rate of 3.2 percent. The District is mainly rural (29.6percent urban) with only four settlements having populations in excess of 5,000. The major settlements with larger populations are Bonyere, Elubo, Half Assini and Tikobo No.1. Population density has increased over recent years with 2000 figures being 82.8 persons per km^2. Almost 15.8 percent of the population are immigrants, mainly settled in the northern part of the District. About 53 percent of immigrants are male and 58percent are in the age group of 18 - 35 years.

- **Nzema East Municipality.** Available population figures for the area are for the former Nzema East District which included the new Ellembelle District. The population of the Nzema East District was 142,871 in the year 2000 with annual growth rate of 2.7 percent. The population density was 65.1 per km^2. The area is largely rural (26.6 percent urban) with most communities having a population of less than 5,000. However, a steady rural to urban migration has seen an increase in the urban populations in recent years. According to the municipal planning office, migrations tend to be seasonal with persons migrating to farming areas during the farming season and to the coast during the fishing season. There is, however, no data to indicate whether there has been an increased migration into the District recently.

- **Elembelle District.** District specific population figures are not available at present as these have not been separated from the former Nzema East District figures. According to the District planning office, it can be estimated that half the population of the Nzema East District (ie approximately 70,000) resides in Ellembelle. The District is mainly rural with only 26 percent of the population living in urban centres.

- **Ahanta West District.** A population of 95,140 was reported for this Distrcitc in 2000 with a population growth rate of 3.2 percent. Based on this growth rate, the population was projected to be 122,817 by the end of 2008. The District is characterised by a high population density of 141/km^2 in 2000 compared with regional population density of 51 per km^2. The high population density of the District indicates population pressure on land and other limited facilities and services within various settlements. Approximately 80 percent of the population lives in rural settlements making Ahanta West a rural District.

- **Sekondi-Takoradi Metropolis.** The population of STM was 369,166 in 2000 and projected to 492,378 in 2009. It is the most populated area in the Western Region and comprised about 15 percent of the regions total population in 2000. Population density is 1,022 people per km^2. The STM has 49 communities and approximately 14 of these settlements have a population exceeding 7,000. The major settlements are Takoradi, Effia-Kwesimintsim, Effiakuma, and Sekondi. Built up areas in the Metropolis can be classified into urban and rural settings. The urban portions constitute about 32percent of the land area and accommodate close to 70 percent of the population. Sekondi-Takoradi, serves as a destination as well as transit point for approximately 80,000 migrants mostly from rural portions of the country that commute to the area in for work. This has resulted in the increased development of slums in the city.

- **Shama District.** The population of the District was reported as 68,642 in the 2000 census. The projected 2008 population is 88,314. The population growth rate of 3.5 percent in 2000 was higher than the regional and national averages of 3.2 percent and 2.7 percent respectively. According to the District planner, the District experiences emigration of economically active people in search of employment in major urban centres.

Age and Gender

The population of the Western Region is relatively young, with approximately 43 percent of the population falling between the ages of 0 and 15 years. A summary of the age characteristics by District is provided in *Table 4.23*. The new Districts of STM and Shama have reported separate data, however, for the Former Nzema East District there is no separate data for Nzema East Municipality and Ellembelle District. STM has the lowest proportion of people between 0 and 15 years (38 percent) compared with the other Districts with between 42 percent and 44 percent. Nearly five percent of the population in the Region are older than 64 years. The age structure follows the known trend of a developing economy with a broad base (many young people) that gradually tapers off with increasing age. STM has the largest proportion of the population (58 percent) in the working age group (15-64 years) in the Region. Jomoro (53 percent) also has a significant proportion of the population in this age group. These figures may be due to migration of young adults to the commercial and mining towns in these Districts.

There is a relatively high dependency ratio in the Region. This is attributable to the high proportion of the population who are not economically active; primarily due to age (younger than 15 years or older than 64 years) and high levels of unemployment. This dependency places a heavy burden on the economically active sector of the population in the District and can lead to low standards of living.

On average, slightly less than 50 percent of the population are female. This may also be linked to the in-migration of male workers into the area in search of opportunities for employment. The age distribution of males and females follows a similar pattern (Population and Housing Census, 2000).

Table 4.23 Age Characteristic by District

Age Characteristics	All Districts*	Jomoro*	Nzema East and Ellembelle*	Ahanta West*	STM**	Shama**
0-14	42.4	41.3	43.1	43.2	37.7	44.8
15-64	53.1	53.4	51.2	51.8	57.6	51.9
65+	4.5	5.3	5.7	5.0	4.7	3.3
Dependency ratio	88.3	87.1	95.1	93.2	93.6	92.7
18 + (% Adult Pop.)	51.7	52.9	51.4	51.1	55.8	n/a

Source: * 2000 Population and Housing Census Western Region; ** 2009 Shama District Profile

Ethnicity and Language

The Western Region consists of various ethnic groups which in Ghana is characterised by one's language or mother tongue. Most of the region's inhabitants are either Ghanaians by birth (92 percent) or by naturalisation (4 percent), with a few immigrants from other neighbouring West African countries (Population and Housing Census, 2000).

Nationally, the Akans constitute the largest ethnic group representing 49 percent of the population. This pattern is reflected in the Western Region. The Akan speaking groups constitute more than two-thirds of Ghanaians in every District; with Ahanta West having the highest percentage (93 percent) and Juabeso-Bia having the lowest (65 percent).

There are five major indigenous ethnic groups in the Region. These are the Ahantas (6 percent), the Nzemas including the Evalue (11 percent), the Wassa (12 percent), the Sefwis (11 percent) and the Aowins (3 percent). These ethnic groupings also represent the major languages spoken in Region.

Other ethnic groups who have migrated into the Region are the Mole-Dagbon (8 percent), the Asantes (7 percent), the Ewes (6 percent), the Ga-Dangme (4 percent), the Brongs (3 percent) and the Kusasis (3 percent). There are a number of other ethnic groups of smaller percentages; namely the Guans, Gurma, Grusi, and Mande, amongst others.

Religion

There are a variety of religious affiliations in the Western Region which depicts the nature of religious pluralism in Ghana. Christianity is the most commonly practiced religion in all the Districts (81 percent), comprising a range of denominations including Catholics, Protestants, and Pentecostals. Islam is practiced by 9 percent of the population, traditional African religion is practised by 2 percent of the population, whilst eight percent of the population profess no religion (Population and Housing Census, 2000).

4.4.4 Economic Activity

Overview

Ghana's domestic economy currently revolves around agriculture (which includes fishing), which employs about 55 percent of the work force, mainly small landholders and artisanal fishers. Other major sources of employment include mining and quarrying (employing approximately 15 percent of the population), and manufacturing, employing approximately 11 percent of the population (Ghana Districts, 2009).

Agriculture and Processing of Agricultural Products

In the Western Region both commercial and subsistence farming is practiced. The region is the largest commercial producer of cocoa and timber and has the largest rubber plantation in the country and its only rubber-processing factory which processes the rubber into a semi finished product for export. Coconut and oil palm are cultivated on a large scale for commercial production of vegetable oil. Subsistence farming is practiced to produce food crops such as cassava, maize, rice, cocoyam, plantain, pepper and tomatoes, and rice is grown in some low-lying areas.

Mining

Mineral mining is extensively practiced in the Western Region. Minerals mined, include gold, diamonds, manganese and bauxite. The Region is the second highest producer of gold in the country. There are five major gold mines in the District namely Teberebie and Iduaprem, Prestea/Bogoso, Tarkwa and Aboso gold fields. Mining is undertaken by multinational companies. There are also some artisanal miners operating in the Region. The countries only bauxite mine currently in production is located at Awaso in the Sefwi District. There are other potential deposits in the Region however these have not as yet been fully explored for exploitation. Deposits of alluvial diamonds in the Bonsa River Basin were exploited by small-scale miners in the 1940s and 1950s. There is however potential that the river basin could still be prospected for diamonds in the future.

Import/ Export

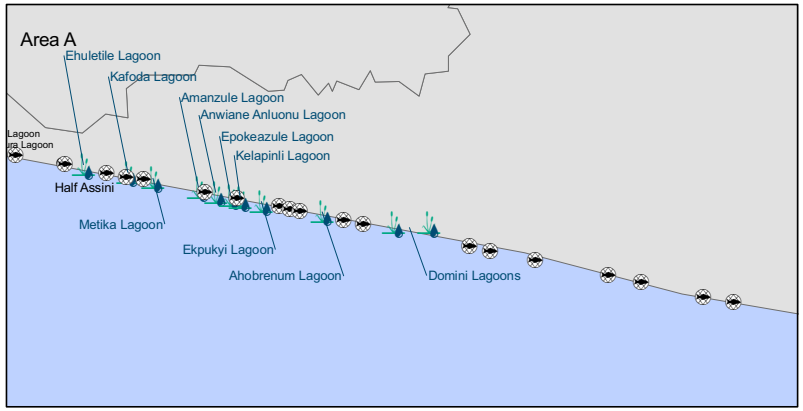
The deep-water port at Takoradi handles about 62 percent of total national export and 20 percent of total national imports annually. The main exports are manganese, bauxite, cocoa beans and forest products (mainly sawn timber). The main imports are clinker (for cement production), containerised cargo, lime products, petroleum products and wheat. The main West African shipping lanes and the approaches to Ghana are shown in *Chapter5: Figure 5.7.*

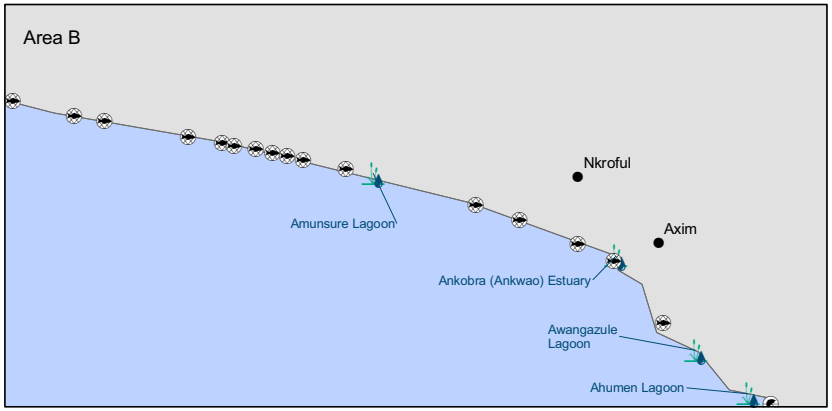
Tourism and Cultural Heritage.

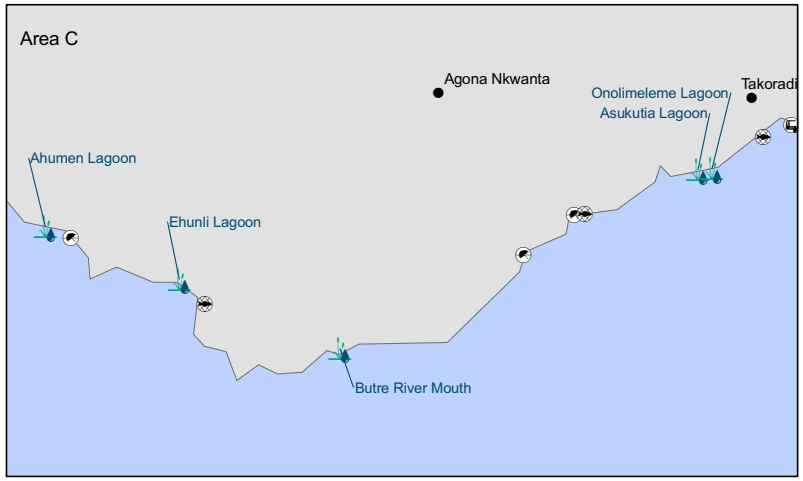
Tourism in Ghana has become a major socio-economic activity and one of the most important and fastest growing sectors of the Ghanaian economy (GSS, 2007). Since the late 1980s tourism has received considerable attention in the economic development strategy of Ghana. The number of tourist arrivals and amount of tourists' expenditure has steadily increased, while both public and private investment activity in various tourism sub-sectors have expanded. In 2004, the sector attracted more than 500,000 foreign tourists with the corresponding tourist receipts of US$ 640 million.

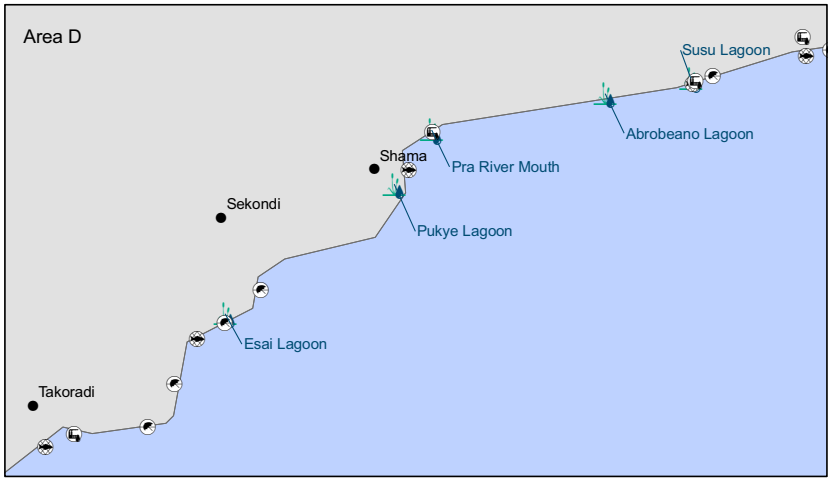
Ghana has a wide range of natural, cultural and historical attractions, which provides the basis for the growing tourism industry. Emphasis is placed on tourism to help in the conservation of the country's historical and environmental heritage. Apart from the economic benefits, tourism is used to present Ghana's unique cultural, historical and environmental heritage to the international community and to educate Ghanaians about their own heritage. The Government of Ghana intends to use tourism as an alternative development strategy to help address broad national issues.

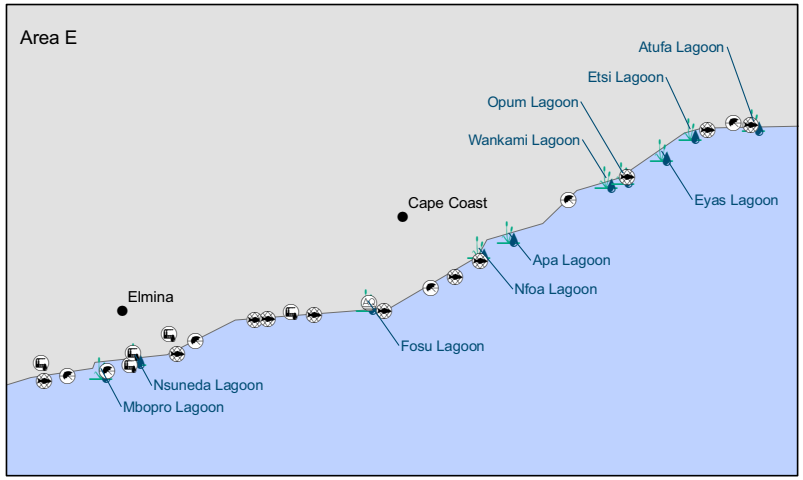
The tourism potential in the Western Region is related to the number and extent of pristine tropical beaches as well as wildlife parks and forest and game reserves featuring tropical rainforests, inland lakes and rivers. Bathing or recreational beaches along the western coastline are shown in *Figure 4.48*. Some of the most popular recreational beaches along the western coastline are located at Biriwa, Brenu Akyinim, Busua, Butre, Cape Coast, Egyembra, Elmina, Komeda, Sekondi and Takoradi. Hotels are generally located at popular beach destination and at commercial centres. Along the western coastline, hotels and resorts are located at Axim, Birwa, Busua, Cape Coast, Elmina and Takoradi. Wildlife and nature reserves in the Western Region include Ankasa Conservation Area including Nini-Suhien National Park, Amansuri Conservation Area and Bia National Park.

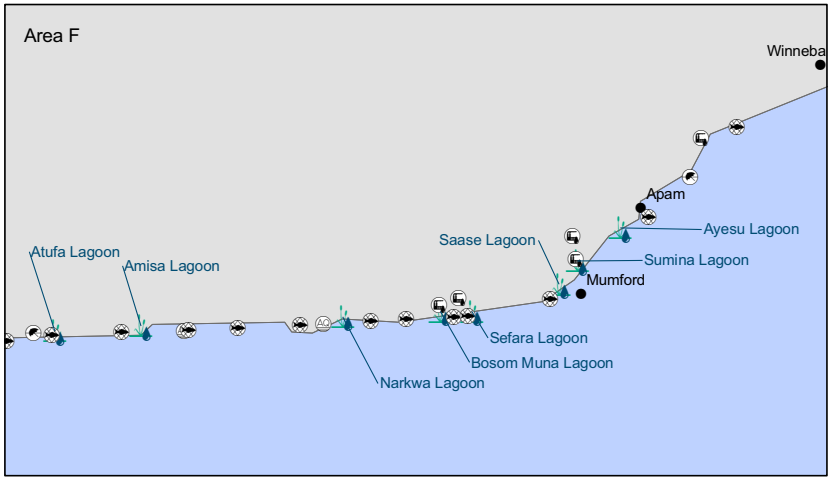






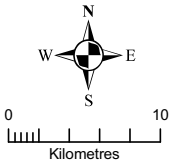


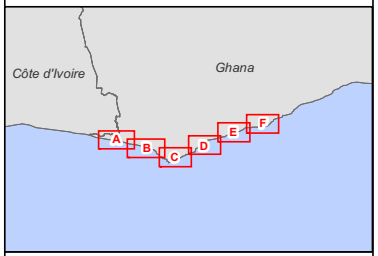




KEY:

- Industrial Water Intake
- Public/Bathing Beach
- Aquaculture
- Beach Seine
- Lagoon, River Mouth or Estuary
- Cities and Towns





TITLE:
Figure 4.48
Human Use includign Recreational Beaches along the Western Coasline of Ghana

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Tullow Ghana		A4
DATE: 06/08/2009	CHECKED: MI	PROJECT: 0096867
DRAWN: CO	APPROVED: MI	SCALE: As Scale Bar
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ERM
Norloch House
36 King's Stables Road
Edinburgh, EH1 2EU
Tel: 0131 478 6000
Fax: 0131 487 3636

SOURCE: EPA Ghana: Environmental Sensitivity Map for Coastal Areas of Ghana, Volume 1, Atlas
PROJECTION: GCS WGS 1984

File: 0096867\Ghana_CO_MXD\MXD\Env\Snstvs_HumanUse.mxd

A number of public sector priority investment projects and areas have been identified along the western coastline (GTB, 2009). Public sector investment projects include beach resort developments at waterfronts such as Axim, Beyin, Busua, Butre, Cape Coast, Dixcove, Elmina, Sekondi, Shama and Takoradi.

The Western Region also has the second largest concentration of historic forts and castles in the country, accounting for seven out of the country's fifteen selected tourist forts under the Museums and Monuments Board. In total, there are 15 historical monuments along the western coast of Ghana. These monuments are listed in *Table 4.24.*

Table 4.24 Historical Monuments along the Western Coastline

Town	Monuments
Beyin	Fort Appolonia built in 1770 by Britain
Sawoma	Monument
Axim	Fort Antonio built in 1515 by Portuguese
Princess Town	Fort Gross Fredericksburg built in 1683 by Brandenburg-Prussians
Akoda	Ruins of an old Fort Dorothea
Dixcove	Fort Metal Cross built in 1692 by British
Butre	Fort Batenstein built in 1656 by the Dutch
Sekondi	Fort of Orange built in 1656 by the Dutch
Shama	Fort St Sebastian built in 1523 by the Portuguese
Komeda	Ruins of Fort Vredenburg built by the Dutch in 1682
	Fort English built by Dutch in 1687
Elmina	Elmina Castle (St George's Castle) built in 1482 by Dutch
	Fort St Jago built in 1665 by Portuguese
Cape Coast	Cape Coast Castle built in 1653 by Swedes
Moree	Fort Nassau built in 1612 by the Dutch
Anamabo	Fort Charles built in 1630 by Dutch
Abandze	Fort Amsterdam built in 1631 by English

Source: Environmental Sensitivity Map for the Coastal Areas of Ghana, 2004

Salt Production

It is estimated that salt production occurs in approximately 14 coastal lagoons along the Ghanaian coast and provides employment opportunities to coastal villages. Salt is collected from lagoon flats in the dry season when salt crystallises out of the super-saturated lagoon water. In addition, dedicated man-made saltpans with low dikes are used (Armah *et al*, 2004). Salt production is not widely practiced in the coastal Districts of the Western Region.

Economic Activity by District

An overview of the economic activity for the six coastal Districts that form part of the study is provided below.

- **Jomoro District.** The economy of Jomoro District consists of a large traditional agricultural sector made up of mostly small-scale farmers, a

growing sector of small informal traders, artisans and technicians, and a small processing and manufacturing sector. Approximately 54 percent of the population is engaged in the agricultural sector, comprised of 39 percent farming and 15 percent fishing. Major crops grown are cassava (40.5%), coconut (16 %), maize (15%), cocoa (9.4%), and plantain (9.4%). The use of traditional farming methods, which include slash and burn and the extraction of wood fuel, is resulting in deforestation. Both inland and sea fishing is another major economic activity and is characterised by the use of canoes with out-board motors and dragnets. The District has extensive rainforest and wood harvesting takes place around Mpataba, Nuba, Ankasa, Tikobo No.1, Ellenda and Anwiafutu area. There are, however, no established timber processing companies in the District. Larger industries in the District include the Wienco factory which manufactures erosion control mats from coconut husks. There is also the Effasu Power Plant which the District planner reported was due to be recommissioned in the near future.

- **Nzema East Municipality and Elembelle District.** Information on economic activities in the area is only available for the former Nzema East District which included both Nzema East Municipality and Ellembelle District. Sixty percent of the population in this area is involved in agriculture and agro-processing. The major tree crops grown are coconut, oil palm, rubber and cocoa with cassava and plantain being the major food crops. Vegetables are also cultivated among other crops and rice is grown in some low-lying areas like Asanta, Kikam, Esiama and Kamgbunli. Food crops such as cassava, maize, rice, cocoyam and plantain are grown extensively both for subsistence and for cash. Coconut is grown extensively in the District especially in the southern part while cocoa is grown commercially in the northern parts of the area. In recent years, Cape St. Paul's Wilt Disease has devastated about half of the coconut plantations in this area. This has seriously affected the economic livelihoods of people in these areas, leading to low incomes and increased unemployment. Fishing is a key economic activity in the area. The District has the second highest marine fish production in Ghana and approximately nine percent of the population is involved in the fishing sector. According to the Ellembelle District planning officer, the area also has economic minerals such as kaolin, silica and gold; the latter which is currently being exploited by the Adamus Resources Limited.

- **Ahanta West District.** Approximately 65 percent of the active population in Ahanta West is directly involved in agricultural production. Farming is the major economic activity in the District. Other economic activities include informal trading, processing of agricultural produce mainly oil palm, cassava, rubber and other trades like hairdressing, dressmaking, carpentry, block-making, auto-electricians, fitting, car-body spraying, refrigeration mechanics or repairers and others. Oil palm and rubber are the major cash crops, however, farming is mainly subsistence in nature. Apart from rubber and oil palm, food crops such as cassava, maize, plantain, vegetables are also cultivated in the District. Significant timber

and sawmills in the Western Region are located in the District. These companies are the major sources of employment and economic activity in the District. NORPALM and Ghana Rubber Estates Limited (GREL) are the two major companies with extensive oil palm and rubber plantations respectively. These companies employ considerable numbers of people in the District. Fishing is an important economic activity for the people of the coastal areas. Dixcove is noted all over the Western Region for its sharks, tuna and lobsters catches. Other important fishing communities include Funkoe, Butre, Aketekyi, Akwidaa, Adjua, Egyambra and Cape Three Points.

- **Sekondi-Takoradi Metropolis (STM).** The major economic activities in STM are related to the port. The area is the third largest industrialised centre in the country and there are significant industrial and commercial activities in the manufacturing sector (food processing, spirits production, textiles, metal fabrication) and resources sector (timber, clay). STM has a large food and goods market which is a centre for small and medium sized trading. The manufacturing industry includes cement, household utilities, cocoa processing and wood processing. The major food items processed are fish, cassava and palm kernel. Fish is mostly smoked at areas like New Takoradi and Amanful. In STM, 19 percent of the population is employed in the agricultural sector. Crop production is practiced at a small scale. Fishing is the predominant occupation category of the agriculture sector, with up to 1,800 people engaged in fishing along the coastline from Takoradi to Ngyeresia. Commercial livestock and poultry farming is largely non-existent in the Metropolis, however, many urban dwellers keep sheep, goats and poultry on free range and household level.

- **Shama District.** Farming and fishing are the main economic activities in the District, employing about 78 percent of the population. Main crops include cassava, plantain, cocoyam, maze rice, oil palm and vegetables. According to the District planning officer, coconut palm was extensively grown in the District until the 1990s when Wilt Disease exterminated most of the trees. The main fishing communities in the District are Abuesi, Shama and Aboadze. These occupy about seventy percent of the coastline of the District. The three communities have about 1,500 registered seaworthy canoes and a catch of about 30,000 t is recovered annually. Large quantities of Birimian rock deposits have been revealed in the District. Small and medium scale quarry firms have started mining the rock reserves. There are no major industries in Shama except for the 550 MW Takoradi Thermal Power Station at Aboadze.

Figure 4.49 illustrates the various agricultural activities in the coastal Districts. Fishing is one of the important economic activities in these Districts and is described in detail in *Section 4.3.*

Figure 4.49 Agricultural Activities in the Coastal Districts

Plantains grown as food crops in Nzema East

Casava plants growing in Shama District

Coconut tree plantation In Jomoro District

Rubber tree plantation in Ahanta West District

Fish landing site in STM

Harvesting of wood for making charcoal

Source: ERM, 2009

4.4.5 *Poverty*

Table 4.25 illustrates the poverty profile in Ghana. The poverty incidence in the Western Region of Ghana ranked third highest and contributed about 6.5 percent to the national poverty level. The levels of unemployment in the Western Region are also considered to be high.

Table 4.25 Poverty Profile in Ghana 2005/2006

Region	Pop. Share (%)	Avg. Income (000's cedis)	Poverty incidence (%)
Western	10.1	7,813.3	18.4
Central	8.8	8,394.3	19.9
Gt. Accra	13.9	1,0871.2	11.8
Volta	7.5	9,590.9	31.4
Eastern	13.4	7,805.7	15.1
Ashanti	16.8	8,284.9	20.3
Brong Ahafo	9.2	6,718.2	29.5
Northern	12.2	4,779.8	52.3
Upper East	4.8	3,409.3	70.4
Upper West	3.6	2,354.4	87.9

Source: Etsey, Y.K.A. 2009.

4.4.6 Education

Ghana has a free basic education system that is compulsory up to age 15. There are six years of primary education, three years junior secondary school education, three years of secondary education and four years of tertiary level education.

According to the 2000 census, 53 percent of the population of Ghana above 15 years of age is literate in either English or a major Ghanaian language and this is higher amongst males than females (Ghanadistricts.com, 2006). In the Western Region the literacy rate is about 58 percent with males having a higher literacy rate (68 percent) than females (48 percent).

The government implemented a National Education Strategy Plan and increased education spending in 53 Districts. This resulted in an increase in the school attendance rate from 71 percent in 2002 to 80 percent in 2004. In the same period access to education by girls has also improved from 66 percent to 72 percent (Ghana: Accelerating Growth to Halve Poverty, 2007). The secondary school enrolment rates tend to be lower than that of primary schools and amongst the overall population 43 percent of Ghanaians have never attended school and 19 percent have primary schooling as their highest level of education (Ghana: Accelerating Growth to Halve Poverty, 2007).

In the Western Region, nearly two-thirds (64 percent) of those currently in school are at the primary level, while 21 percent are in junior secondary school. Literacy in English and a Ghanaian language is highest in Sekondi Takoradi (42 percent) and lowest in Ahanta West (29 percent) (Population and Housing Census, 2000).

The lack of junior secondary schools within many rural communities, affordability and poor infrastructural facilities are factors that contribute towards the high dropout rate from primary school and low levels of attendance at secondary and tertiary educational facilities. In the Western Region, Shama Ahanta East has the highest number of teaching staff. Approximately, 15 percent of teaching staff is based in this District because of

the high number of schools and pupils. The lowest number of primary teaching staff was recorded in Ahanta West District and the lowest numbers for secondary teaching staff occur in Juaboso.

4.4.7 Health

Improvements to health and nutritional status remain a national focus, with the major causes of morbidity and mortality being malaria, skin diseases, diarrhoeal diseases, intestinal worms, measles, onchocerciasis and HIV/AIDS. Overall there is declining infant mortality (120 per 1,000 live births in 1965 to 68 per 1,000 in 2005) and increasing life expectancy (from 44 years in 1993 to 58 years in 2005) (WHO Core Health Statistics, 2007). In rural areas only 64 percent of the population have regular access to improved drinking water sources.

Malaria is prevalent in the Western Region as a result of poor sanitation (stagnant pools of water) and exposure to mosquitoes. Pregnancy complications appear to be due to a lack of awareness and ignorance of the importance of pre-natal health care.

District specific health data were sourced from medium-term District development plans and District health directorate annual reports. Data from most Districts were limited, with the most comprehensive data available for STM.

- **STM and Shama District.** Malaria continues to be the most common disease reported at Out-Patient Departments (OPD), followed by acute respiratory infections and acute eye infection (*Table 4.26*). Cases of epidemic diseases diagnosed in STM in 2008/9 included cholera and diarrhoeal diseases (GHS, 2009). Current data from the HIV/AIDS Sentinel Report for 2008 indicates a decrease in the prevalence rate in the Metro from 3.2% in 2007 to 2.9% in 2008. The record shows an alternating increase and decrease in the prevalence rate from 2003 to 2006 but a consistent decrease in the rate from 2006 to 2008. The disease affects all age groups with the highest incidence occurring between ages 15 to 49. This is in line with the national trend which shows that the disease affects the youth who are sexually active and those in the economically active group. Nationwide it was identified that more females are infected in 2007. For example, 68% of those infected were female.

Table 4.26 Top Ten Causes of OPD Attendance in STM First Half of 2008 and 2009

No	Disease	No of cases	% of total	No	Disease	No of cases	% of total
2008				**2009**			
1	Malaria	60,862	40.7	1	Malaria	82,430	42.3
2	Acute Respiratory Tract Infections	14,697	9.8	2	Acute respiratory tract infections	12,009	6.2
3	Skin diseases and ulcers	7,236	4.8	3	Acute eye infections	9,138	4.7
4	Acute eye infections	5,694	3.8	4	Diarrhoeal diseases	8,721	4.5
5	Diarrhoeal diseases	4,891	3.3	5	Skin diseases and ulcers	7,206	3.7
6	Hypertension	3,585	2.4	6	Hypertension	2,485	1.3
7	Chicken pox	2,884	1.9	7	Intestinal worms	2,485	1.3
8	Intestinal worms	2,006	1.3	8	Acute Urinary Tract infections	2,434	1.2
9	Rheumatism/Joint disease	1,838	1.2	9	Gynaecological conditions	2,192	1.1
10	Dental caries	1,803	1.2	10	Chicken pox	1,952	1.0
	Total cases	149,580			Total cases	194,961	

Source: Ghana Health Service Sekondi-Takoradi 2009 Metro Mid Year Report

An overview of the health status in other coastal Districts is provided below.

- **Jomoro District.** Malaria ranks the first of the top 10 diseases in the District. In 2008, malaria recorded 48.2% in OPD cases and 72.5% of hospital admissions. The ten top diseases in Jomoro as at 2008 are as follows (JDA, 2009): malaria, anaemia, cerebrovascular accidents, diabetes mellitus, hepatitis, hypertension, infestation worms, tuberculosis, meningitis and HIV/AIDS. HIV/AIDS is prevalent in the District and has the highest rate of infection in the Region. The high infection rate is attributed to the regular cross border activities between Ghana and Cote d'Ivoire with long distance truck drivers staying over in border towns such as Elubo while waiting for their goods to be cleared.

- **Nzema East Municipality and Ellembelle District.** Health data is only available for the former Nzema East District. Most common diseases in the area include malaria, anaemia and diarrhoea. Other diseases include gastroenteritis complications in pregnancy, hypertension and bronchopneumonia. Diseases like elephantiasis, guinea-worm and goiter are common in the District. The HIV/AIDS prevalence rate of 15.5 percent for the District is very high compared to the national average of 3.2.

- **Ahanta West.** Malaria is the most common disease in the District. The people in the District also suffer from diseases which include gastroententis, upper respiratory tract infection, hypertension, typhoid, anaemia, cholera and others. The HIV/Aids prevalence rate in the District has decreased from three percent in 2004 to 2.8% in 2006. The decrease in the prevalence was mainly due to the formation of peer educators in schools and communities to educate the people on the causes and

prevention of HIV/AIDS as well as condom distribution through out the District.

4.4.8 Social Infrastructure and Services

Education Facilities

There are a broad range of educational facilities in all of the Districts, including pre-schools, primary schools, junior high schools, senior high schools and tertiary institutions. These facilities fall into public and private categories that are run by the government, individuals or religious organisations. There are 1,320 primary schools in the Region, 1,240 of these are public and 80 are private schools. There are half as many junior secondary schools as there are primary schools, which indicates that access to these schools would be more difficult for some children in the Region. Consequently children living in localities where junior secondary schools are not within reasonable distances are likely to drop out of school after primary school (Ghana Districts, 2009). Access to senior secondary school in the Region is poor compared to access to primary schools and junior secondary schools. There are 42 senior secondary schools in the Region, with most concentrated in the Sekondi-Takoradi area. An overview of educational facilities for the Districts is provided below.

- **Jomoro District.** The District has 68 primary schools, 53 junior secondary schools and two senior secondary schools. The District has focussed on the provision of infrastructure such as classroom blocks and provision of furniture; however, many school blocks are in poor condition and need major rehabilitation.

- **Nzema East Municipality and Elembelle District.** Educational infrastructure in the area is in fairly good condition. However, some facilities require renovation. Numbers of educational facilities are only available for the former Nzema East District. The following facilities were available: 132 pre-schools, 138 primary schools, 67 junior secondary schools, four senior secondary schools and three tertiary level institutions, namely Kikam Technical Institute, Esiama Public Health Nursing School and Asanta Teacher Training.

- **Ahanta West District.** The District has private and public educational facilities including 90 pre-schools, 86 primary schools, 54 junior secondary schools, three senior secondary schools and a vocational/technical school.

- **Sekondi-Takoradi Metropolis and Shama District.** There are 177 pre-schools in STM, 161 primary schools, 144 junior high schools, 19 secondary high schools, four technical/vocational schools and nursing and teacher training colleges under public management. School facilities within the area are evenly distributed, so there is easy access to these facilities and children travel short distances to attend school.

Health-Care Facilities

The health care facilities available in the Region include hospitals, clinics and traditional health facilities. Hospitals (in and out patients) in the Western Region can be categorised into private and publicly owned. Public hospitals in the Western Region are available at the Effia Nkwanta Regional Hospital, European Hospital, and Takoradi Hospital. Private health care facilities, including company, mission and NGO-owned facilities are fairly well represented in the Region. Almost every mining company operating in the Region has such a facility (Population and Housing Census, 2000).

A clinic is mainly an out patient unit that provides several of the medical services provided by a hospital, but has limited facilities for patients requiring periods of confinement, observation and complicated medical interventions. While over 80 percent of localities in Shama-Ahanta East have easy access to a clinic facility within 10km radius, 60 percent of localities in Ahanta West have access to clinics within the same radius (Population and Housing Census, 2000). Ten percent of localities in these two Districts are located more than 30km from the nearest clinic.

In the Region the estimated doctor-to-patient ratio is very low, at about 1 to 18,500. This makes the work of traditional healers very important. Traditional healers are health practitioners who use herbs and herbal preparations in healing. In Ghana, it is estimated that between 60 percent and 80 percent of the population rely on traditional healers for primary health care. In the Western Region they are in almost every community in the region and in every District. In all the Districts between 60 percent and 92 percent of the localities have traditional healers within the locality (Population and Housing Census, 2000).

An overview of health facilities in the Districts is provided below.

- **Jomoro District.** There is one hospital at Half-Assini, four health centres at Tikobo 1, Ekabaku, Samenye and Elubo, and five community clinics located in some of the larger settlements. Community Health Planning Services (CHPS) compounds exist also at Takinta, Mpataba, Bonyere Junction, Nungua and Kengen. In addition, there are three primary health care facilities which function as first point of call for basic health care services.

- **Nzema East Municipality and Elembelle District.** A number of health facilities exist in the area. Data for the former Nzema East District indicates a total of two hospitals, six health centres and a number of health promotion and preventive facilities, including traditional birth attendants.

- **Ahanta West District.** The District has a number of health facilities including one hospital at Dixcove, two health centres at Agona Nkwanta and Apowa, five clinics, seven CHPS compounds, two private health

facilities, 82 Out-Reach Points. The District has only two doctors and two medical assistants.

- **Sekondi-Takoradi Metropolis.** STM has the highest concentration of health delivery facilities and services in the Region. There are 31 private hospitals, 5 government health centres, and a further 5 community clinics/maternities, some of which offer 24-hour maternity and casualty services. The metropolitan area also has a rehabilitation clinic for mentally ill patients. In addition to these, there are 18 private general medical practitioners, 5 private registered midwives, a total of 186 Traditional Birth Attendants (TBA), and three private medical laboratories. Substantial success has been achieved in delivering healthcare to the populace and in eradicating endemic diseases (Ghana Districts, 2009).

- **Shama District.** There are two hospitals, two health centres and one clinic in the District. According to the District planning officer, the Shama Health Centre is being upgraded into a District hospital to serve as a referral point for all satellite health facilities. Many remote areas have no access to health facilities. The Shama District in conjunction with the District Health Directorate are planning to establish CHPS compounds in ten communities by 2010 to improve geographic access to health services delivery.

Emergency health services available in the six Districts are outlined in *Table 4.27*. The Minister for Health(1) recently expressed concern over the state of emergency services in Ghana in response to an incident involving a gas tanker explosion. A new National Ambulance Service Bill will be passed in due course and there are plans to transform the ambulance unit into a national ambulance service, to improve pre-hospital services. Other emergency services available in all six Districts include the National Disaster Management Organisation (NADMO), the police service and the Ghana National Fire Service.

(1) Ghanaian Chronicle, Thursday, 09 Apr 2009: Ambulance service Ghana not the best.

Table 4.27 Emergency Health Services Available by District

District	Health Institutions	Ambulance services
Jomoro	Half Assini Hospital	No ambulance available
Nzema East	Axim Hospital, Axim	No ambulances available
Ellembele	Eikwe Hospital	One ambulance available
Ahanta West	Discove Hospital	No ambulances available
Sekondi Takoradi	Effia Nkwanta Regional Hospital	Two ambulances available, one based on site and the other at the Fire Service station
	Ghapoha Hospital	One ambulance available.
	Esikado Hospital	One ambulance.
	Kwesimintsim Polyclinic	No on site ambulance
Shama	VRA Hospital	One ambulance

Source: Deputy Regional Director in Charge of Public Health, Western Region, Takoradi

Water

There are three major sources of drinking water namely, piped (inside, outside, tanker supply), well (well, borehole) and natural (spring, river, stream, lakes, rainwater, dugout). In the western region only 32 percent of houses have access to treated piped water with 8.5 percent having this available within their dwelling places. The highly urbanised Districts have almost 100 percent availability of, or accessibility to piped water. This is in contrast to rural Districts where over 60 percent of households use rivers, streams, dugouts, spring or rain water as their main source of water, with only approximately 9 percent having access to processed piped water. Others use wells as their main source of water. An overview of the water sources is presented in *Table 4.87.*

Table 4.28 Overview of Water Resources

Water Access Type	All Districts	Jomoro	Nzema East	Ahanta West	Shama-Ahanta East
Total Households	409,282	22,137	29,591	23,064	86,511
Piped -Outside	23.2%	15.5%	10.6%	14.4%	59.7%
Piped Inside	8.5%	1.3%	2.2%	2.9%	27.3%
Tanker Supply	0.7%	0.5%	0.3%	2.2%	0.7%
Well	23.2%	32.9%	32.1%	28.5%	7.8%
Borehole	14.2%	14.8%	14.5%	28.6%	1.2%
River/Stream	24.1%	31.2%	36.3%	16.0%	1.3%
Spring/Rain	4.4%	3.1%	3.4%	5.7%	1.4%
Dugout	1.5%	0.7%	0.6%	1.5%	0.3%
Other	0.2%	0.0%	0.0%	0.1%	0.3%

Source: Population and Housing Census, (2000) Note: Statistics unavailable for newly created Districts.

Sanitation

The indiscriminate disposal of solid waste in gutters, open spaces and the sea has led to unsanitary conditions in some Districts. Added to this is the unavailability of toilet facilities with over 40 percent of dwellings in the Western Region having either no toilet facilities or having to use a public toilet. The environs of these public toilets are being turned into solid waste dumps with serious health hazards in many of the urban and peri-urban localities (Population and Housing Census, 2000). Where facilities do exist in the region, the most common types are Kumasi Ventilated-Improved Pit (KVIP), pit latrine or a bucket/pan system. Where no facilities exist, people are forced to make use of the beaches, outlying bushes and gutters.

Energy Sources

Electricity and kerosene lamps are used as the main sources of lighting in the Western Region, providing about 99 percent of the lighting needs of households. In the urban areas, the majority of households use electricity while in the rural Districts, kerosene lamps are the main source of lighting. Rural households are also gradually gaining access to electricity through a rural electrification programme. An overview of access to electricity for the Districts is provided below.

- **Jomoro District.** A large portion of the population in Jomoro (55%) does not have electricity. The large towns in the District such as Half Assini, Elubo, Tikobo 1, Jaway Wharf and Mpataba have all been connected to the national grid; however, settlements on the south western part of the District such as Newtown, Nzimtianu and other parts in the north, have no power. Those with power experience voltage fluctuations and frequent power interruptions.

- **Nzema East Municipality and Elembelle District.** Households in the urban areas have access to electricity, while a large number of peri-urban and rural households are also gradually gaining access to electricity through the rural electrification programme, even though this programme has a very long way to go and benefited only a few communities which are fairly close to urban centres.

- **Ahanta West District.** Electricity services have been expanded to include communities such as Media, Boakrom, Aboadi, Kubekor, Aboagyekrom, Enmokanwo, Boekrom, Ellobankanta and others under Self Help Electrification Project (SHEP). Most people have access to electricity, however, regular power outages are common due to inadequate infrastructure such as transformers.

- **Sekondi-Takoradi Metropolis and Shama District.** Almost 90% of the Metropolis has been connected to the electricity grid through the SHEP. Street lighting is, however, a problem in the Metro. A number of communities in the metropolis are without electricity, these include newly

schemed areas. The Metro, as a whole, experiences frequent power outages. In Shama, almost the entire (95 %) District is connected to the national electricity grid.

Charcoal and fuel wood are the main sources of cooking fuel in the Region (even for quite a sizeable number of urban dwellers), however liquid petroleum gas (LPG) and coconut husks are also used in some Districts as a source of cooking fuel. The use of electricity for cooking is minimal being limited to Sekondi-Takoradi with its highly urbanised status and access to electricity.

The Takoradi Thermal Power Plant lies on the coast approximately 17 km east of Sekondi-Takoradi, and relies on marine water for cooling purposes (*Figure 4.50*). The Thermal Plant started operation in 1997, and was initiated by the Volta River Authority to complement the existing Hydro Plant at Akosombo and Kpong. The Takoradi Thermal Power Plant is therefore a facility of strategic importance for meeting Ghana's energy needs (Volta River Authority, 2006). The plant has historically been fuelled by crude or fuel oil but conversion to use of natural gas from the West Africa Gas Pipeline (WAGP) occurred in 2008 though initial flows have been intermittent.

Figure 4.50 Takoradi Thermal Power Plant

Source: ERM, 2009

There are two existing bulk fuel storage facilities in STM, namely the Shell and GOIL depots located between Poasi and New Takoradi (*Figure 4.51*). According to the STMA planning officer, a third bulk fuel facility is planned by Cirrus in the same area. Takoradi Port also has dedicated oil berthing facilities. Fuel is distributed via road tanker to filling stations in the coastal District either from Tema or Takoradi. Other than the effects of intermittent

national fuel shortages, none of the Districts experience problems with fuel availability.

Figure 4.51 GOIL Bulk Fuel Storage and Fuel Station in Takoradi

Source: ERM,. 2009

Land and Housing

The ownership of land in Ghana is based on the fundamental principle that land is owned by the community or group. Under the existing arrangement, traditional land-owning authorities (stool chiefs, clan heads and skins) hold allodial (absolute ownership) title to land on behalf of their people. Thus outright ownership of land is still a rare form of land tenure in Ghana. Leases and rentals over a satisfactory period of time for economic/commercial activities are possible and involve permission by the allodial titleholders to use the land. However, the land must revert to the community or the allodial titleholder at the end of the lease or at cessation of the activity for which the lease was granted (Asumadu, 2003**).**

The land tenure system in Ghana makes it easier for rural households to acquire and own land than those living in urban areas. The fact that building houses in rural areas is easier than in urban areas also contributes to making house ownership more prevalent in the rural areas. People living and working in urban areas tend to rent houses in the area close to where they work, and then build their own houses in their home towns or villages where they either visit every weekend, or expect to retire. Districts with high migrant labour have a high number of people renting dwelling units as opposed to owning houses. Rent-free housing is common, due to the extended family system, this happens in situations where the owners of these houses may have moved to live in the city to work and may allow relatives to stay in their houses for free.

The population living in urban areas accounts for 36 percent of the Region's population (2000 Population and Housing Census), and has been attributed primarily to a steady drift of rural migrants to the urban areas, and also as a result of the growth of previously rural communities into urban centres.

The 2000 Population and Housing Census gives the number of dwelling units, including vacant units, in the Western Region as 430,180. Compound houses constitute the greater number of dwelling units. Flats or apartments are common in Sekondi Takoradi whereas huts and other types are common in many rural Districts. Other types of dwellings include uncompleted or temporary shelter or farm houses constructed with coconut branches or clay, which are used seasonally.

4.4.9 Transport

Transport and Road Infrastructure

The Ghana Private Road Transport Union (GPRTU) and other transport organisations provide transport services within the Districts in the Region. The most common means of transport is by road where there are privately owned or state owned buses. The state owned buses usually operate within the urban areas. In the villages, private taxis and small buses owned by private individuals are operational. The road network in the Western Region is limited and the conditions of the roads can be very poor, particularly in the rainy season. Goods such as bauxite, manganese, timber and timber products and cocoa are transported by rail on the Western Line which runs from Takoradi to Kumasi and Awaso.

An overview of transport and road infrastructure in the relevant Districts is provided below.

- **Jomoro District.** Thirty-six percent of roads in Jomoro are trunk roads while the remaining 64 percent are feeder roads. The roads tend to be generally muddy and slippery during the wet season and sometimes become inaccessible. An exception is the trunk road which traverses the District in an east-west direction to Takoradi and which forms part of the

Trans-West African Highway. In 2007 and 2008 there were major improvements in road rehabilitation. Boats are an important mode of transport for goods and passengers in Jomoro District. There are communities along the Juan Lagoon and other river bodies which can only be accessed by boat.

- **Nzema East Municipality and Elembelle District.** The former Nzema East District has a total of 154 km of trunk roads, of which 64 km are metalled. The metalledtrunk roads form part of the Trans-West Africa Highway. The rest of the trunk roads are gravel or earth-surfaced. Apart from the trunk roads, the District has a total of 253 km of feeder roads, of which 40 percent are in poor condition. Over 70 percent of these feeder roads are in the southern half of the District.

- **Ahanta West District.** The road networks (mostly feeder roads) have been improved by 10%. This has opened up the District for easy access to farming communities and market centres. In 2006, for example, 14 feeder roads underwent maintenance. Due to the poor condition of some of the feeder roads, some parts of the District are not easily accessible, especially during the rainy season.

- **Sekondi-Takoradi Metropolis and Shama District.** Most of the roads in the STM, particularly those within the urban centers have been over stretched. There is rapid development taking place in the hinterland and a significant proportion of these areas is without access roads. The condition of the road network in the Metropolis stands at 51.6% good, 28.2% fair and 19.6% poor. The total length of all-weather roads in the Metropolis has been extended from 330 km in 1996 to over 400 km in 2006.

Ports and Harbours

The Port of Takoradi was built as the first commercial port of Ghana in 1928 to handle imports and exports to and from the country. The port currently has a covered storage area of 140,000 m^2 and has an open storage area of 250,000m^2. It has a wide range of vessels supporting its operations including tugboats, lighter tugs, a water barge and a patrol boat. The Port handles both domestic and transit cargoes and currently handles about 600 vessels annually, which is 37 percent of the total national seaborne traffic, 62 percent of total national export and 20 percent of total national imports annually. Almost 160,000 tonnes of cargo are handled annually at the port. The Port of Takoradi also has a fishing harbour located at Sekondi, which has an ice plant that can accommodate vessels with up to 3 m draft. Other ship traffic in the area is associated with ports such as Abidjan (Côte d'Ivoire) and Lagos (Nigeria).

Airports

The Takoradi Airport is the only civilian airport in the Western Region. The airport has one runway. Ghana Air Force also has a base at the airport. At least one scheduled domestic flight lands and takes off from this airport daily.

4.4.10 Waste Management

Waste management is a serious issue in the Western Region like many others in Ghana. The predominant means of waste disposal is either by dumping; this may be at specified sites; or indiscriminately burning or burying. Approximately 60 percent of all households in all the Districts use a specified public dump while an additional 29 percent use unauthorised dump sites to dispose of waste. The waste from these open dumps washes into streams and rivers which often serve as sources of water for local communities. Collection and disposal of waste by the local authorities accounts for only about 2 percent of all households. Households in Sekondi Takoradi, more than any other District, use collection agencies and public dumping sites. A site visit of the existing waste handling facilities was undertaken in May 2009 to determine the suitability of these facilities for the wastes from the Jubilee Project. A summary of the exisiting waste management facilites is presented in *Annex F*.

4.4.11 Police Services

Police services in the Region are those offered by the Ghana Police Service. Most communities have a Police Station and every District capital has a District Police Headquarter with a Regional Police Headquarter in the regional capital. The Western Region Command of the Ghana Police Service is located in Takoradi. Apart from the Police Service, chiefs and elders in the communities are responsible for settling disputes.

4.4.12 Fire Service

Fire response capability in Takoradi exists through the National Fire Service and the Ghana Ports and Harbours Authority Fire Service Department. There are reportedly a total of five fire tenders at the National Fire Station's disposal in case of emergencies. The port has two fire tenders and the airport, one.

4.4.13 Telecommunications

Two main types of telephone systems are in operation in the country. These are the fixed line telephones and the mobile telephone systems. Other systems being operated are wireless, radio telephone and satellite communication systems. Vodafone Ghana Telecom Company operates over 95 percent of the fixed line telephones in the country. Teledensity of fixed line telephones in the Western Region is 0.3 telephones per 100 persons, which is below the national average of 0.7. Of the 12,985 fixed lines the Region recorded in the year 2000, 11,046 or 86 percent served the Sekondi Takoradi metropolis. The Western Region is extensively covered by the following mobile telephone operators: MTN, Vodafone, Ghana operators of Vodafone, Tigo, Kasapa and Zain. The Region has the second highest locality coverage by MTN, which is the largest mobile telephone system in the country. Mobile telephone coverage is poor in the northern part of Nzema East Municipality and in Jomoro District.