



The Republic of The Gambia



Renewable Energy Study

“Energy Demand Assessment and Projection”

October 2005



Bad Vilbel – Germany

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LIST OF SYMBOLS

Length

mm..... millimetre
m..... metre
km..... kilometre

Area

cm²..... square centimetre = 10⁻⁴ m²
m²..... square metre
ha..... hectare = 10⁴ m²
km²..... square kilometre

Volume

ml..... millilitre
l..... litre
m³..... cubic metre
km³..... cubic kilometre

Weight

mg..... milligram
g..... gram
kg..... kilogram
t..... ton

Time

s..... second
min..... minute
h..... hour
d..... day
mon..... month
a..... year

Electric / Energy Measure

kV..... kilovolt
kW..... kilowatt
kWh..... kilowatt hour
MW..... megawatt
MWh..... megawatt hour
GJ..... Giga Joule
GW..... gigawatt

GWh..... gigawatt hour
GWh/a..... gigawatt hour per year
GWh/mon..... gigawatt hour per month
TOE Tons of oil equivalent
TWh terawatt hour
TWh/a terawatt hour per year
MJ Mega Joule
MVA megavolt ampere
kVA kilovolt ampere
Hz..... hertz

Money

ct Cent
EUR Euro
GMD..... Gambian Dalasi
USD United States Dollar
USct United States Cent

Conversions

1 kV	=	kilovolt	= 10^3 volts (V)
1 kW	=	kilowatt	= 10^3 watts (W)
1 MW	=	megawatt	= 10^3 kilowatts (kW)
1 kWh	=	kilowatt-hour	= 10^3 watt hours
1 GWh	=	gigawatt-hour	= 10^6 kilowatt hours
1 km	=	kilometre	= 10^3 meters (m)
1 cm	=	centimetre	= 10^{-2} meters (m)
1 ton	=	metric ton	= 1,000 kg
1 TOE	=	tons of oil equivalent	= 11,630 kWh

LIST OF ABBREVIATIONS

°C.....	Degree Celsius
e.....	estimated
E	Energy
EIA.....	Environmental Impact Assessment
EU.....	European Union
e.g.	for example
GBA.....	Greater Banjul Area
GDP.....	Gross Domestic Product
GREC	Gambia Renewable Energy Centre
HFO.....	Heavy Fuel Oil
IPP.....	Independent Power Producer
i.e.....	that is
KMC.....	Kanifing Municipal Council
LI.....	Lahmeyer International GmbH (Bad Vilbel, Germany)
LGA.....	Local Government Area
LPG.....	Liquefied Petroleum Gas
LV	Low Voltage
max.	Maximum
MV	Medium Voltage
min.	Minimum
Mio.....	Million
NAWEC	National Water and Electricity Corporation
NGO	Non-Governmental Organisation
O&M.....	Operation and Maintenance
%.....	Percent
PV	Photovoltaic
PRSP.....	Poverty Reduction Strategy Paper
T.....	Thousand
TL.....	Transmission Line
TOR.....	Terms of Reference
TPP.....	Thermal Power Plant
UK.....	United Kingdom
URD.....	Upper River Division
V	Volume

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1 INTRODUCTION

1.1 AUTHORISATION

On 09 July 2004, the two parties

- (1) the Energy Division Office of the President of the Republic of the Gambia, as Client, and
- (2) Lahmeyer International GmbH (LI), as Contractor

concluded a contract for the preparation of a Renewable Energy Study for the Republic of the Gambia.

By this contract, Lahmeyer International is entrusted to review studies and projects already undertaken on renewable energy, analyse data available with relevant governmental and non-governmental organisations on site investigations.

The Renewable Energy Study is undertaken in two phases and comprises a range of expert studies and corresponding reports, one of which is the report in hand "Energy Demand Assessment and Projection". Objectives and scope of this report are described in the following section 1.2.

1.2 OBJECTIVES AND SCOPE

Being part of the first executed phase of the project, this report is a detailed analysis of the energy demand in the country. By the means of an appropriate method, it comprises the Gambia's energy demand assessment per customer group (residential, agricultural, industrial etc.) and per energy source (e.g. primary energy sources such as fuelwood, and secondary energy sources such as electricity). The rate of use for each energy source will be discussed (i.e. seasonal, month of the year etc.). Furthermore the study comprises an updated demand assessment for the electricity consumption of grid-connected consumers, based on data provided by the national utility.

Based on the above mentioned data and investigations, this part of the Renewable Energy Study delivers energy demand projections per type and consumer category. The forecast indicates the power demand for electricity and all major primary energy sources applied in the Gambia.

According to the Terms of Reference, the forecast is prepared in sufficient depth which allows matching of demand to renewable supplies of energy. The horizon for the energy projections is 2025 and it is presented by the means of tables and diagrams. The evolution of the projections in reference to the applied demographic and economic scenarios is thus easily comprehensible.

The assessment in this report provides the base for the investigation of possible alternatives to the current energy consumption structure, in order to achieve economic gains in terms of poverty reduction, sustainable development and efficient allocation.

1.3 FUNDAMENTAL DEFINITIONS FOR THIS REPORT

- (1) *Demand Forecast*: It is an essential prerequisite for the utility's development planning, in particular for system expansion planning. Thereby it must be considered: *If projected demand levels are too low*, serious adverse economic consequences for consumers and the economy at large could occur; *If projected demand levels are too high*, excess resources can impose undue financial hardships on the utility and its consumers. In addition, this situation results in unnecessary and high economic opportunity costs associated with resource misallocation.
- (2) *Electricity Demand at Sent-out Level*: The rate at which electric energy is delivered to a system (or part of a system). The electricity demand at sent-out level includes technical losses, non-technical losses, self consumption, suppressed demand and the final electricity demand.
- (3) *Installed Capacity*: The sum of the capacities and the power plant ex generator.
- (4) *Technical Losses*: Electric energy or capacity that is wasted in the normal operation of a power system. Some kilowatt-hours are lost in the form of waste heat in electrical apparatuses such as substation conductors. *Line losses* are kilowatt-hours lost in transmission and distribution lines under certain conditions.
- (5) *Final Energy Demand*: The final energy demand is the demand at customer side, which actually can be measured and billed by the utility / supply company. It is equal to the sum of energy demand of each customer, customer group or sector. For analysis and projections, the final demand shall be divided into the following main sectors. Residential Customers. Commercial Customers, Institutional Customers, Industry and Agriculture Customers.
- (6) *Non-Technical Losses*: Commercial losses which can occur due to power stealing by "customers", malfunctioning of energy meters, incorrect data evaluation or statistics.
- (7) *Base and Peak Load*: The base load is the minimum amount of electric power required over a given period of time at a constant rate. Within a daily / weekly or monthly load pattern, this is the level of demand, that is seen as a minimum on most hours, including evenings, thereby forming the "base" on which peaks the rest.
- (8) *Load Factor*: A percentage telling the difference between the amount of electricity a consumer used during a given time span and the amount that would have been used if the usage would have stayed at the consumer's highest demand level during whole time.
- (9) *Suppressed Demand*: The suppressed demand is the present or expected amount of energy curtailment per year due to demand exceeding available capacity. Factors resulting in suppressed demand are unreliable generation; load shedding or an insufficiently developed network.

2 GENERAL

For the assessment of the current demand of the Gambia and its future projections, historical data has been analysed in several ways as well as undocumented data has been collected or estimated. This information was analysed in regard to several relevant fields and in different categories.

Chapter 4 of this report will comprise the assessment of the Gambia's demography by harnessing the latest available data in this context. This report provides thus an overview on the population of the Gambia and its development, which is going to be broken down into the country's legal and administrative entities, the Local Government Areas (LGAs). In this context, the household numbers and sizes will be examined, as they will be an important indicator for the energy demand forecast of the Gambia.

Chapter 4 of this report will provide a detailed analysis of the Gambian economy. It constitutes of the three main sectors agriculture, industry and service, whose development will be presented in comparison, but also as a break-down into sub-sectors of the respective branches.

A thorough assessment of the Gambia's Energy Consumption will be undertaken in Chapter 0 of this report. First of all, the primary energy sources (i.e. fuelwood and several oil products) which are utilised in the present and the past in the country will be presented. Furthermore, the historical development and the current situation of the use these sources will be discussed for the consumer sector such as the residential, industrial, commercial, institutional and agricultural sector and a split-up of the national energy balance will be provided. This chapter will also provide the seasonal dependence of the different energy source's requirements








Whereas Chapter 0 concentrates exclusively on the primary energy sources, Chapter 6 examines the Gambia's electricity sector. This analysis concentrates on the service area of the local utility NAWEC. After a presentation of the development of NAWEC's installed and available generation capacity, the consumption characteristics of its grid-connected customers will be provided in general and in detail. Besides a seasonal split-up of the consumption per sector and the determination of the suppressed demand, also future trends in electricity consumption will be projected in Chapter 6.

The use of primary and secondary energy sources as presented in Chapters 0 and 6 will be summarised in Chapter 7. By the means of a Sankey diagram, the Gambia's energy balance along the whole supply chain will be demonstrated, considering input, throughput and output of the energy. Chapter 8 provides the projection of future energy requirements in the Gambia, and gives an insight into the methodology and assumptions applied. The forecasts indicate the power demand for electricity and all major primary energy sources within the period 2005-2025.

The consumption or demand of the different primary energy sources (such as heavy fuel oil, kerosene, jet, liquefied petroleum gas, gasoline, diesel and firewood), and furthermore of the secondary energy source (electricity) is subject of different chapters and sections within this report.

For a better understanding, the relevant characteristics of the respective energy sources are visualised in a range of charts, tables and diagrams. In order to respective coherence, a consistent colour code has been chosen throughout the whole report. The legend for the colouring in connection with the appropriate energy source is introduced in the following Table.

Table 1: Colour scheme for the presentation of the different energy sources

Colour Code	Energy Source
	Heavy Fuel Oil (HFO)
	Kerosene/Jet
	Liquefied Petroleum Gas (LPG)
	Gasoline
	Diesel
	Firewood & other Biomass
	Electricity

3 THE DEMOGRAPHY OF THE GAMBIA

During the preparation of that report, the Central Statistics Department of the Gambia finalised the evaluation and computation of data based on the 2003 population and housing census. Therefore, this energy demand study includes as the first assessment of its kind the newest available demographic data.

The Gambia is a small country at the southern edge of the Sahel populated by a number of ethnic groups. These groups are geographically intermixed and no areas of the country are dominated by villages of just one ethnic group. It is significant for a study on grazing land tenure that the Fula, with their transhuman pastoralist origins, are one of the major ethnic groups in the country. However, nowadays Gambian Fulas, like other ethnic groups in the country, are settled agropastoralists.

By African standards, The Gambia is densely populated with more than 120 persons per square kilometre (total surface area: 11,295 km²). Annex 1 gives an overview for the whole African continent. The Gambia as a whole is very rural and even in rural areas the population density is high. The country is dominated by the river from which it derives its name. It is a narrow strip of land paralleling the river, seldom more than forty kilometres wide. Because there are few ferry crossings and no bridges the country is effectively cut in two and movement across the land border to Senegal is generally easier than movement across the river. Fully one-fifth of Gambia's surface area is covered by the river and swamps along its banks (see following Figure 1)



Figure 1: Satellite View on The Gambia and Neighbouring Areas of Senegal (Source: Visible Earth)

Table 2: Development of Population Number (1993-2003)

Local Government Area / District	Population 1993 [capita]	Population 2003 [capita]	Average Annual Change [a-a %]
THE GAMBIA	1,038,145	1,360,681	2.8%
BANJUL	42,326	35,061	-1.9%
KANIFING	228,214	322,735	3.5%
BRIKAMA	234,917	389,594	5.2%
MANSAKONKO	65,146	72,167	1.0%
KEREWAN	156,462	172,835	1.0%
KUNTAUR	67,774	78,491	1.5%
GEORGETOWN	88,247	107,212	2.0%
BASSE	155,059	182,586	1.6%

The population of the Gambia in 2003 is estimated at 1,360,681² from 1,038,145 in 1993. This suggests an annual population growth rate of 2.8 % down from 4.2% during the 1983 to 1993 inter-census period. At this growth rate the population doubling time is estimated at about 25 years. Different Local Government Areas experienced different population growth rates as result of internal migration. After experiencing a 63% increase in population between 1963 and 1983, the City of Banjul experienced an annual decline in population of 4.2% between 1983 and 1993 and at an estimated rate of 2.2% during the 1993 –2003 inter-census period. This decline was due to an out migration from Banjul to the suburbs in Kanifing Municipal Council area as commuting to and from Banjul became easy. Table 2 shows a comparison of population number in 1993 and 2003 for the Gambia in total, and individually for several regions, which will be explained later in more detail. Under consideration of an annual change of the overall population number by nearly 2.8% the present number of country's inhabitants is estimated at 1,442,400 (2005).

At present about one-in-four Gambians live in the Greater Banjul Area, the region comprising the City of Banjul and Kanifing Municipal Council. The area occupies 93 km² (0.08% of the total land area). The proportion increases to 34% when we include Kombo North, the district bordering Greater Banjul Area. An estimated 789,000 live in the City of Banjul, Kanifing and Brikama Local Government Area, about 55% of the total population. The City of Banjul is the most densely populated district (approx. 3,400 persons per km²),

² The provisional results of "2003 population and Housing Census" published in April 2004 by the Central Statistics Department referred a total number of 1,364,500 (percentual divergence: 2.8 %).

followed by the Kanifing Municipal Council (approx. 3,100 persons per km²) and Kombo North (approx. 459 persons per km²). Districts with the lowest population density include Kiang West (approx. 20 persons per km²) in Lower River Division, Foni Bondali in Western Division (approx. 30 persons per km²) and Sami in Central River Division with a density of 32 persons km².

3.1 LEGAL AND ADMINISTRATIVE BACKING OF DEMAND ASSESSMENT

To consider the individual regional characteristics of current and future energy demand, the assessment follows the administrative classification already applied by the Central Statistics Department for census and other statistical research purposes. The country has been divided into eight Local Government Areas (LGA), each corresponding to an administrative division, municipality or capital city, except Kuntaur LGA which corresponds to the north of the Central River Division.

In the following a short cross-section is provided, which includes for each division an overview of population number and its development in recent years (according to the latest results of National Census up to 2003) .

Table 3: Classification of Local Government Areas and Administrative Divisions

Local Government Areas	Administrative Division
LGA OF BANJUL	Greater Banjul Area (GBA)
LGA OF KANIFING	
LGA OF BRIKAMA	Western Division
LGA OF MANSAKONKO	Lower River Division
LGA OF KEREWAN	North Bank Division
LGA OF KUNTAUR	Central River Division
LGA OF GEORGETOWN	
LGA OF BASSE	Upper River Division

The **Greater Banjul Area** consists of the City of Banjul (St. Mary's Island) and the agglomeration of Kanifing Municipal Council (KMC) sometimes called Kombo St. Mary Division. Occupying an area of 88 km² (less than 1% of Gambia's land area), Greater Banjul Area is home to a population of 357,800 (26% of the country's population).

The City of Banjul is the seat of government with the State House and the National Assembly, Supreme Court and all but a few of the Government departments based there. The country's only port is in Banjul with a number of fish landing and processing facilities. Banjul's position as the largest city and the center for commerce and trade is slowly being eroded by the emergence of Serre Kunda and surrounding Kanifing Municipal Council formally Kombo St. Mary Division as most populous and commercial center in the Gambia. Banjul's population peaked in 1983 at 45,000. Since then over-crowding and establishment of public transportation system has led to people relocating to Kanifing Municipal Council. Since 1963, the population of KMC increased from less than 12,000 to 322,000 by 2003.

The **Western Division** is the division immediately south of Kanifing Municipal Council, stretching from Tanjeh on the Atlantic coast to Sintet in Foni Jarrol. With a population of 389,600, the Division is the most populous local government area. There are 9 districts in the Division with Kombo North the most populous. Between 1963 and 2003, the population of Western Division increased from 55,000 to over 389,600 primarily in the three districts immediately neighbouring Greater Banjul Area. The population of Kombo North the district immediately bordering KMC increased from 80,000 in 1993 to over 162,000 by 2003.



Figure 2: Impression of Normal Course of Life in Selected Areas

The divisional headquarter is Brikama. With a population of 65,000, Brikama is the largest city in the Division. Other major towns in the Western Division are Lamin, Wellingara, Sukuta, Kerr Serign and newly established settlement of Brusubi housing estate. Many of these new settlements are along the Atlantic coast.

The **Lower River Division** with a population of 72,200 is the least populated division in the Gambia. Until late 1960s when it became its own division, North Bank Division was part of Lower River Division. With Mansakonko (king's hill or government hill in Mandinka), LRD has 6 districts with Kiang West District (KMC) the largest. Like all other divisions east of Western Division, the the division has suffered from steady out-migration of population to either Banjul, the Western Division or KMC.

Kiang West is the largest and least populated district. Jarra Central home to both Mansakonko and Soma, the economic capital of the division is the most populous district. Jarra Central has experienced rapid expansion in its population throughout the 1980s and 1990s. The rapid growth was driven in part by its role as one of the hubs on either side of the Bambatenda-Yelitanda crossing along the Trans-Gambia Highway. The Trans-Gambia Highway is the main trunk road linking Cassamance and the rest of Senegal. During the Senegambia Confederation, Jarra Central and the town of Soma in particular has seen a rapid increase in cross-border commerce and trade fueling the rapid influx of people into the area. Eight of the 10 largest settlements in the Division are in Jarra Central.

The **North Bank Division** occupies the western third of the north bank of the Gambia from Barra to the border with Lower Saloum in Central River with Senegal's Kaolack and Fatick regions to the north. The Upper Baddibu is the largest and most populous of the 6 districts in the Division. The headquarter is Kerewan although Farafenni is the most populous town and Barra the one with the most economic activities of the division. Until the expansion of the Ferry services to Barra and the construction of the bridge across Mini Minyang Bolon at Kerewan, the division had suffered a lot due to poor access to Banjul.

Upper Baddibu district with Farafenni as main town in the division is the largest and most populous district. The district located opposite Jarra Central along the Trans-Gambia Highway benefited from the growth in cross-border trade during the 1980s and early 1990s as a result of the Senegambia Confederation resulting in the influx of migrants from neighbouring Senegal and other districts in North Bank and Central River. However, the population of Upper Baddibu stabilised by the early 2000s after the collapse of the Confederation.

The **Central River Division** (formerly MacCarthy Island Division) with an area of about 3,038 km² is the largest Local Government Area in the Gambia. The division consists of 10 districts including MacCarthy Island with the headquarter in Janjanbureh (formerly Georgetown). Because of difficulties in logistics between the north and south bank, the division is sometimes considered as two Local Government Areas, with Kuntaur the de facto headquarter for the north bank and Janjanbureh the headquarter for the south

bank. Formally called Lemaine Island, the island was purchased by the British Crown in 1832 and renamed MacCarthy Island after Sir Charles MacCarthy, the English governor at the time. Shortly after, a fort and a trading post were built on the Island. Up until the late 1960s, the Janjanbureh was the unofficial “upcountry capital” with the country’s only boarding school. Since independence, however, Georgetown has slowly lost to Bansang the status as the Division’s de facto economic capital. This was primarily due to inaccessibility to the Banjul and the rest of the country. Central River Division has 10 districts including MacCarthy Island. Fulladu West is the largest and most populous district in the Division. With only 26% of the land area, the district is home to 39% of the total population in 2003.

With some 182,600 inhabitants (2003) the **Upper River Division** ranks on third place in comparison with the population number of other divisions. The Upper River Division (URD) includes the four districts Fulladu East, Kantora, Wuli and Sandu. With a population of nearly 99,000, the district Falluda East is the largest settlement in the division. It includes the Gambia’s easternmost town Basse Santa Su, the capital of the Local Government Area. Basse town is a lively settlement with trading houses from the turn of the century, shops, and a riverside market. Occupying an area of 2,700 km², Upper River Division is the second largest division behind North bank (LGA of Kerewan). Population density amounts to 88 persons per km².

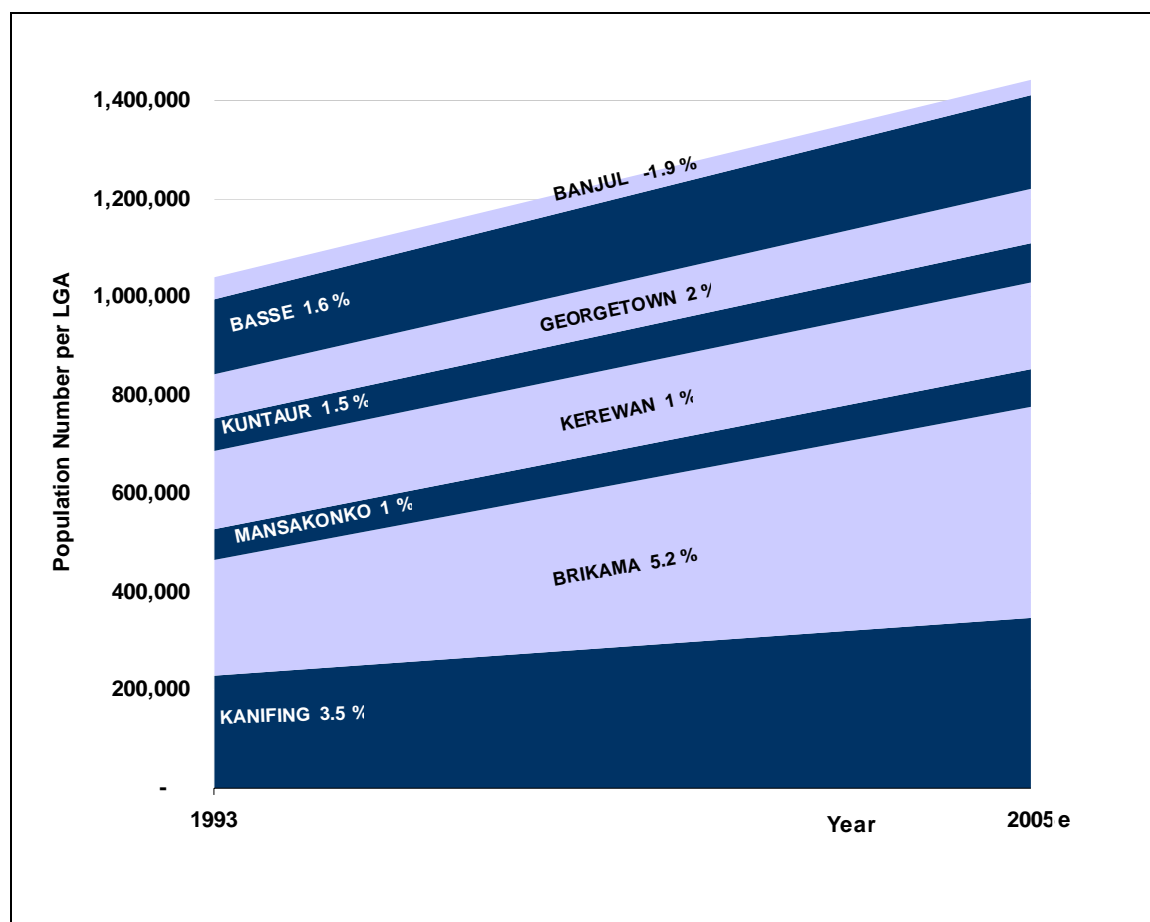


Figure 3: Development of Population Numbers per Region (1993-2005)

Figure 3 above illustrates the demographic development for each region described above. A projection of population number was carried out based on calculated annual changes which occurred during the decade 1993-2003. The highest annual growth rate is observed for the LGA of Brikama with some 5.2% followed by Kanifing with 3.5%. Except Banjul with its already mentioned population number decrease, low annual changes are registered for the eastern parts of the Gambia. The lowest growth rates are registered for the North and Lower Bank Division, each region by only 1%. The figures underline the results of discussions with local authorities carried out by the Consultant. Beside migration from rural to urban areas, the main migration direction in the Gambia is from east to west. In particular in the GBA neighbouring area, the LGA of Brikama people settle down due to better opportunities to take up employment. The population's economic situation will be discussed in more detail in section 3.3 Poverty Situation. Annex 2 shows in detail the demographic figures for each LGA and each single district. A comparison of 1993 and 2003 figures is included.

Finally Table 4 gives an insight in the estimated population number of the Gambia by the year 2005. These figures as well as the applied regional break down are one of the input information which will be used as base for the projection of country's future energy demand.

Table 4: Population Number per Local Government Area (2005)

Local Government Area / District	Population 2005e [capita]
THE GAMBIA	1,437,107
GREATER BANJUL AREA	379,400
LGA OF BANJUL - URBAN ONLY	33,700
LGA OF KANIFING - URBAN ONLY	345,800
LGA OF BRIKAMA	431,800
LGA OF MANSAKONKO	73,700
LGA OF KEREWAN	176,300
LGA OF KUNTAUR	81,000
LGA OF GEORGETOWN	111,400
LGA OF BASSE	188,700

3.2 HOUSEHOLD NUMBER AND AVERAGE HOUSEHOLD SIZE

Except in Banjul, all other regions experienced a rise in the number of households and hence an overall increase of the number of households from 116,001 in 1993 to 157,494 households ten years later. This showed an increase of more than 36 % in the number of households over the inter-censal period. Banjul witnessed a drop in the number of households from 7,032 in 1993 to 6,744 households in 2003 representing a percentage decline of 4.1. the largest increase in number of households was observed in Brikama LGA with a percentage increase in the number of households of 77% followed by Kanifing LGA, which also witnessed a substantial increase of nearly 58%. Apart from Banjul, which recorded a negative change, for Mansakonko LGA the lowest increase in number of households with an increase of only 3% is observed.

Changes in average household size observed have shown variations in trends with some regions experiencing a decline whilst others witnessed an increase. Predominantly urban LGAs registered a decline in average household size whilst rural LGAs showed an increase in average household size. Increases in average household size were observed in Mansakonko, Kuntaur, Janjanbureh and Basse LGAs. The LGA of Kerewan was the only predominantly rural LGA with a decline in average household size although the decline was quite insignificant. Declines in average household size was also observed in Banjul, Kanifing and Brikama LGAs. Overall, there has been a downward trend in the average household size from 8.9 in 1993 to 8.6 in 2003. The downward trend in household size observed in urban LGAs might be attributed to a combination of factors.

The Central Statistics Department estimates that the influence of western education on attitude to family is significant among these factors. Increased education tends to negatively impact the desire for large family sizes. Another factor may be associated with the movement of a large proportion of the population from the agricultural sector to other sectors of the economy over the years, making large family sizes less attractive.



Figure 4: Impressions of the Residential Sector in The Gambia

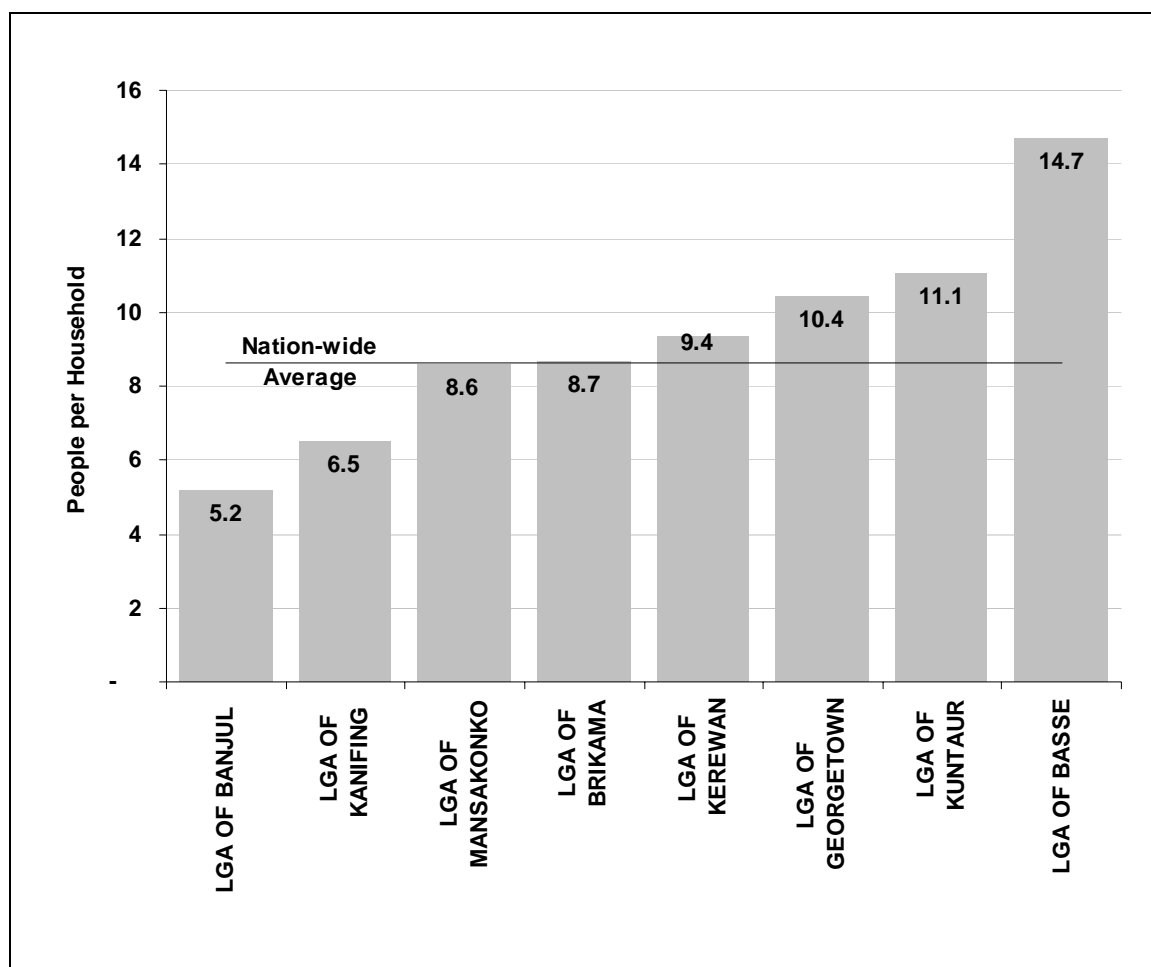


Figure 5: Comparison of Household Sizes in Several LGA

The above Figure 5 illustrates the average household sizes for each Local Government Area of the Gambia. Mansakonko and Brikama are those two LGAs, which are most representative for the nation-wide characteristic. In both LGAs, an average of approximately 8.6, respectively 8.7 people live in one household. With 5.2 and 6.5 people per household, the both urban areas Banjul and Kanifing are the regions with the lowest household sizes. The comparison in the figure shows that in general the household size increases from the Gambia's west to eastern LGAs. The highest value is registered in Basse, with an average of 14.7 people. This indicator is nearly three times higher than the related figure of Banjul.

3.3 POVERTY SITUATION

The Gambia is one of the poorest countries in Africa. In 2005, the Gambia was ranked 155th (out of 177) in the United Nations Development Programme-Human Development Index. The poverty line is a given level of goods and services (food and non-food) regarded as essential for a minimum standard of living. Households whose consumption fall below the poverty line are classified as poor and those above it as non-poor. In the

case of the Gambia, two absolute consumption poverty lines were established, based on estimated minimum requirements (taken as 2700 kcal per day per Adult Equivalent Unit), as follows:

- **Food poverty line** amounts to GMD 2,964 per equivalent adult per year. The food basket contains items that provide a healthy life at a relatively low cost taking into consideration the relative perceptions of living standards in the society.
- **Overall poverty line** of yearly GMD 5,539 per equivalent adult. The overall poverty line is composed of food poverty line adding an allowance of non-food requirements to guarantee a life on the subsistence level.

The Household Poverty Survey Report shows in Table 5 that there is a high increase in the overall poverty line of some 62% to 127% in 1998 compared to 1992. This increase can be traced back to the facts as follows:

- few items in the food basket were substituted by cheaper or much easier available items;
- the price data, when valuing the food consumption basket in 1998, was inappropriate;
- regular rise in the consumer price index over this period.

Poverty in the Gambia is particular more often found among women and in rural areas. Although urban areas were increasing in 1998, as a result of increasing rural-urban migration, 62% of the population fell below the overall poverty line in urban areas, compared with 80% in rural areas. Within rural areas, poverty prevalence rates with the highest levels of extreme poverty, approximately 50% have been located in the Lower and Upper River Division. Central River and North Bank Division had slightly lower rates of approximately 45%, while the Western Division had the lowest rate of approximately 20%. This is shown in Table 6.

Table 5: Comparison of the Consumption Value in GMD/a per Adult Equivalent Unit (1992– 1999)

Region	Census 1992/93		Census 1998		Absolute Change from 1992 to 1998	
	Food Poverty Line	Overall Poverty Line	Food Poverty Line	Overall Poverty Line	Food Poverty Line	Overall Poverty Line
Greater Banjul Area	1636	2443	2964	5539	81%	126%
Other Urban Areas	1597	2404	2610	3898	63%	62%
Rural Areas	1371	1778	2576	3088	88%	74%

Source: NHPS Report 1998

Table 6: Population below Poverty Line (1998)

Region	Extremely poor	Poor [%]	Non-Poor
The Gambia in Total	29.7	17.2	53.1
Banjul	1.7	17.5	80.8
Kaniging	6.8	11.8	81.5
Lower River	50.5	13.4	36.1
Central River	43.3	11.7	45
North Bank	45.9	20.9	33.2
Upper River	49.2	16.1	34.8
Western	20.2	24.5	55.2

Source: NHPS Report 1998

A characteristic feature poor households is household size. While a large number of non-poor households consists of less than 5 members, only 10% of extremely poor and 20% of poor households are of this size. Rather poor households have an average of 6 to 10 family members, whereas these households' incomes are below the food and non-food poverty lines.

Table 7 shows the distribution of income divided into quintiles and grouped in categories of the Gambia's population. As can be seen, households in the highest income quintile have incomes 13.8 times that of the lowest one. The average expenditure of consumption amounts to GDM 9,690 in Greater Banjul, which is greater than the Gambia's that amounts to GDM 5,926. In comparison with The Gambia's average consumption expenditure the Other Urban one's spend GDM 4,927 and in rural area GDM 3,038 on consumption.

Table 7: Comparison of the Consumption Value in GMD per Year per Adult Equivalent Unit

Region	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile	Mean expenditure per adult aquality
The Gambia in Total	1189	2262	3579	6004	16611	5926
Greater Banjul Area	1413	2322	3644	6102	17395	9690
Other Urban Areas	1422	2201	3695	5910	12395	4927
Rural Areas	1156	2256	3488	5790	14618	3038

Source: NHPS Report 1998

To show the income distribution in detail, the average income for households varies in administrative divisions. The highest average income can be earned in Kanifing and Banjul, whereby the lowest average income is paid in the Lower River division. Figure 6 represents the average incomes by division in GDM per year per Adult Equality Unit compared to the Gambia's average income which is shown as line.

Table 6 shows that most of the households living below the poverty line are located in Lower River, Central River, North River and Upper River Division. Relying on the rural characteristic of this area, traditional biomass fuels such as fuelwood, crop residues, and dung are used as energy source for cooking and heating. Figure 7 illustrates that countries with very high poverty are highly dependent on traditional energy, while countries with poverty levels less than 50% are distinctly clustered into two groups of low traditional energy dependence and high traditional energy dependence. The Gambia (located with the data (47; 99) belongs to the second group, which is highlighted in black.

Further, a negative relationship exists between access to electricity and proportion of population below poverty. Only 20% of the 47% of population that live below the poverty line have access to electricity: This is shown in Figure 8 where the Gambia's position is highlighted in black. However, the relationship between poverty and access to electricity in the sample PRSP countries is less robust because electrification is influenced by several supply-side factors, lag effects of energy infrastructure, limited grid connectivity, poor distribution system, and unrecorded connections.

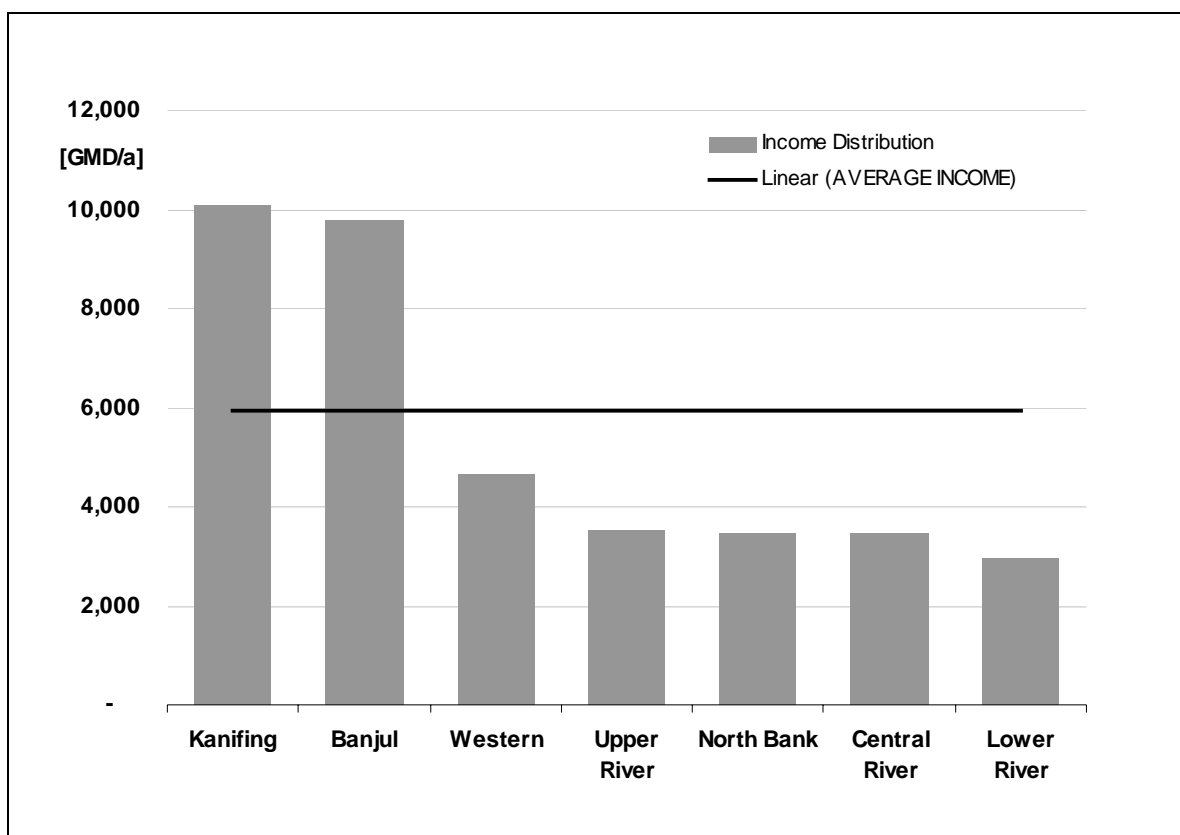


Figure 6: Income Distribution of Households by Division (1998)

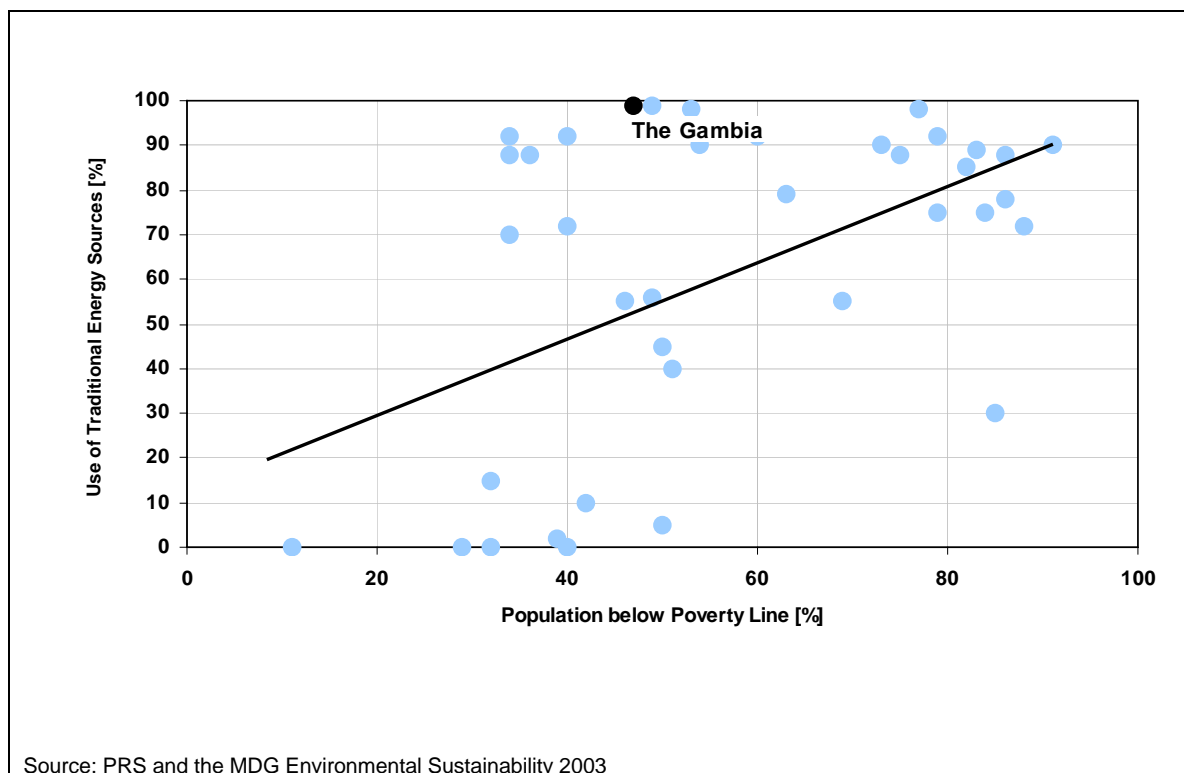


Figure 7: Poverty Incidence and Traditional Energy Dependence in PRSP Countries

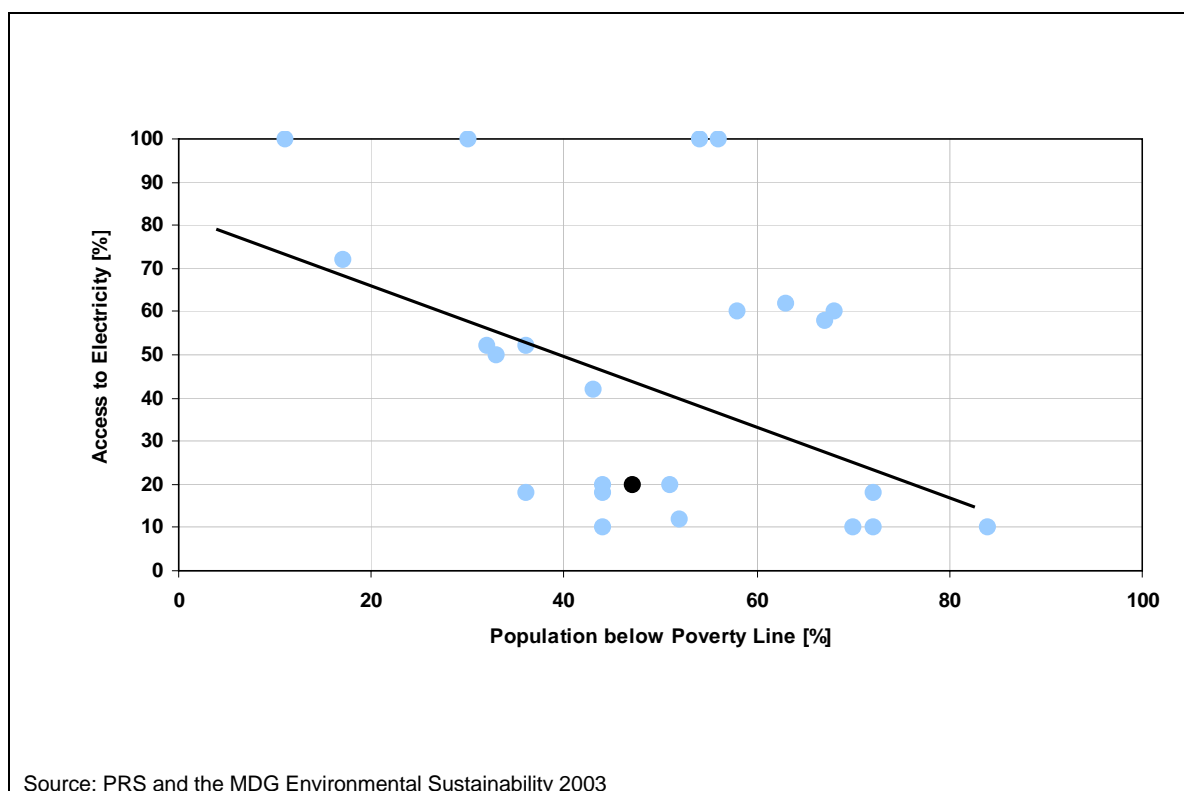


Figure 8: Poverty Incidence and Access to Electricity in PRSP Countries

4 THE ECONOMY OF THE GAMBIA

The Gambia has a liberal, market-based economy characterised by traditional subsistence agriculture, a historic reliance on groundnuts (peanuts) for export earnings, a re-export trade built up around its ocean port, low import duties, minimal administrative procedures, a fluctuating exchange rate with no exchange controls, and a significant tourism industry.

4.1 PRESENT CONDITIONS

Agriculture accounts for 28.7% of the gross domestic product (GDP) and employs 75% of the labour force. The agricultural sector is dominated by the production of groundnuts that contributes alone to 49% of the GDP proportion due to crop production. These figures underscore the predominant position that groundnut production (and in addition groundnut exports) occupy in the Gambian economy. They also bring out another significant feature of the economy, namely its openness. This is further manifested by the vulnerability of the economy to fluctuations caused by unexpected changes in groundnut production and in world prices for groundnuts and their products.

Other food crops feature in the agricultural sector as well, the major ones being rice, millet, sorghum and maize. Rice is cultivated mainly in upriver swamps along the Gambia River. Although cotton was introduced in the 19th century, efforts to increase the area -

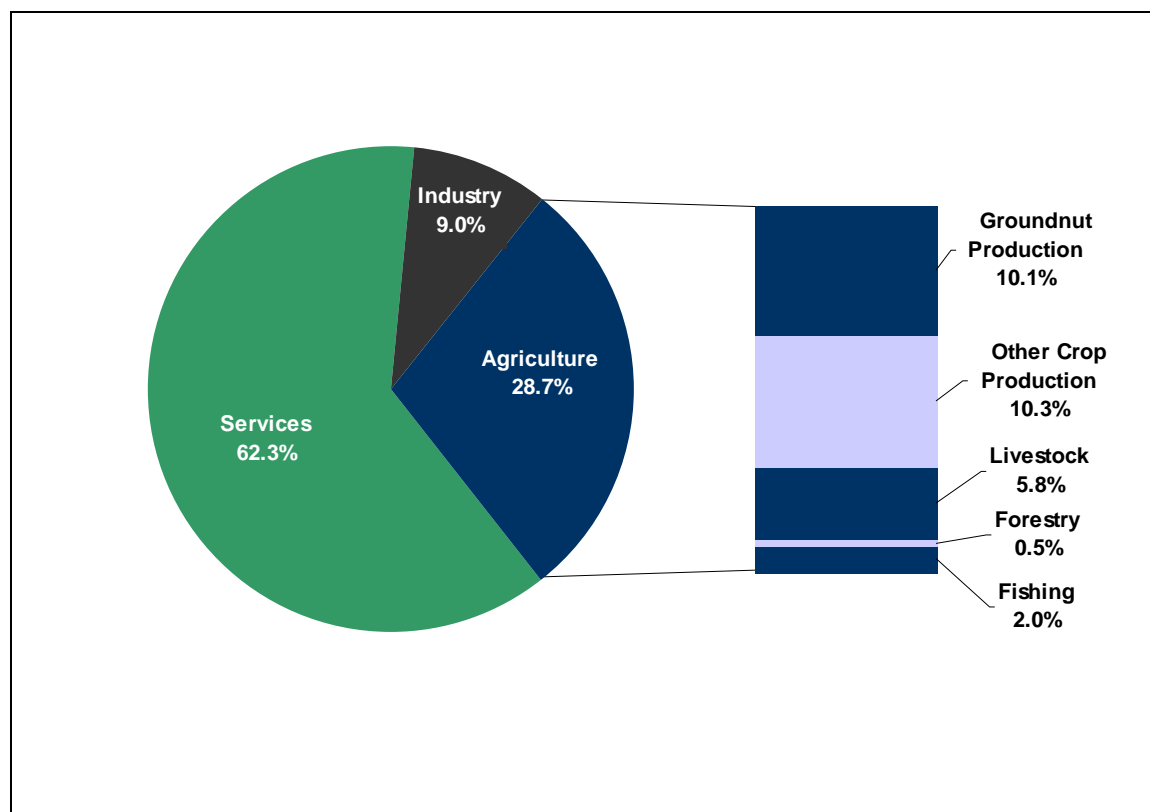


Figure 9: Contribution to GDP by Economic Activity – Focus: Agriculture (2003)

under cultivation to a significant degree have not yet been successful, and hence cotton production represents a very small proportion of agricultural output. Other important sub-sectors of the agricultural sector are livestock and fisheries. Here again, although both have vast potential, it is by no means fully exploited. Livestock and fisheries together account for only 5.8% or 2.0 % respectively of the Gambia's GDP. The smallest proportion is contributed by the forestry sub-sector by 0.5% of the total. Figure 9 provides a detailed insight into the composition of the agriculture sector and the proportion of GDP output for each individual sub-sector.

The **Industrial sector** is very small in Gambia, and its contribution to GDP is estimated to be only 9%. The large and medium scale manufacturing sector³ provide an output of only 2.3%, small scale manufacturers some 1.2%. The limited amount of manufacturing is primarily agriculturally based (e.g., peanut processing, bakeries, a brewery, and a tannery). Other manufacturing activities include soap, soft drinks, and clothing.

As shown in Figure 10, also the mining and quarrying sector plays no significant role in GDP contribution with only 0.6%. The estimated reserves of recoverable minerals yield a conservative total of about 995,000 tonnes at a 1% cut-off grade. Further investigations will be conducted to update the reserve base of these minerals. The following minerals have been identified in The Gambia following some mineral exploration programmes

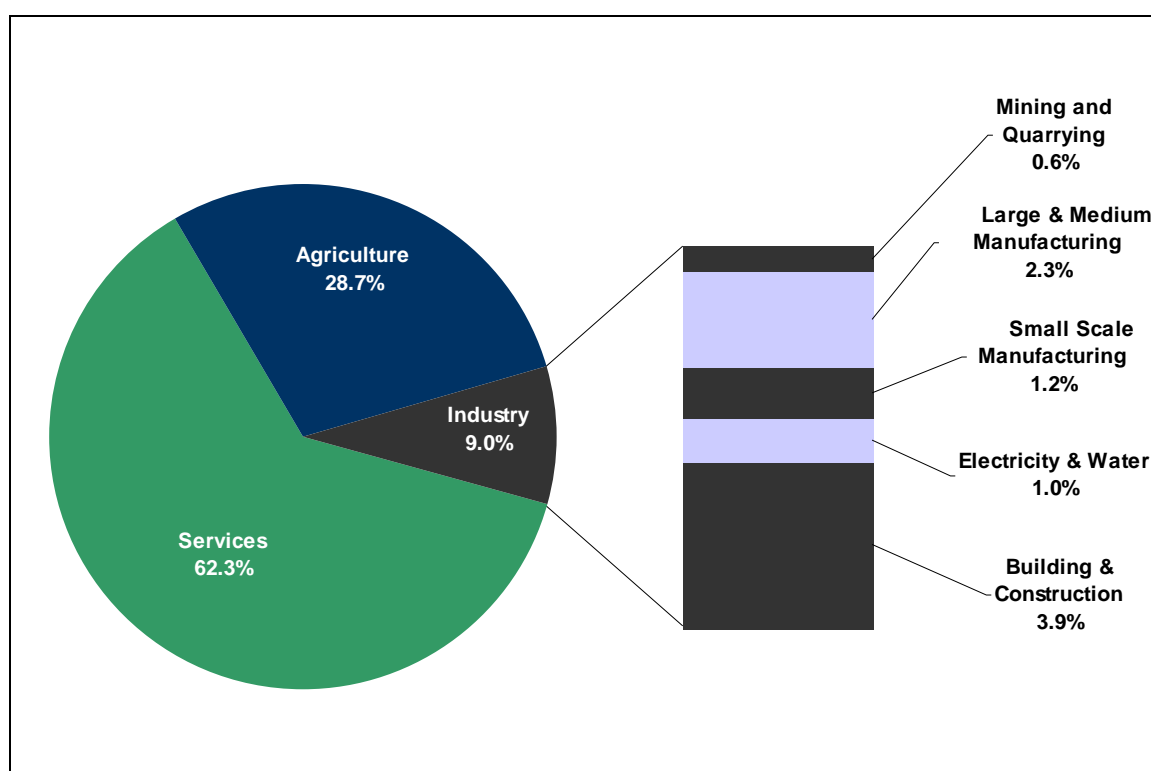


Figure 10: Contribution to GDP by Economic Activity – Focus: Industry (2003)

³ Medium and large scale manufacturing includes more than 4 workers per facility.
Small Scale manufacturing includes less than 5 workers per facility.

conducted with the lead participation of the Geological Department.

- Quartz Sand - large reserves of quartz sand, suitable for glass manufacture, have been identified in the Greater Banjul Area, and also notably in Abuko, Brufut, Darsilami (Western Division); Mbankam and Bakendik (North Bank Division); and Kaiaf, (Lower River Division). The Government continues to seek interested investors to exploit these deposits.
- Heavy Mineral Beach Sand Deposits - the raised beach sand, which is characteristic of The Gambia's coastal beaches, contain ilmenite, rutile, and zircon. The deposits were briefly mined in the past and recently the Government is keen in attracting interested investors in exploiting the deposits.

The **service sector** occupies an important position in the economy of the Gambia. It contributes nearly two thirds of the GDP. As Figure 11 illustrates, the major sub-sectors are trade and transport. Foreign trade plays a vital albeit diminishing role in The Gambia's economy development. Its contribution to GDP amounts to 26.3% in 2003. The UK and other EU countries constitute The Gambia's major domestic export markets, accounting for more than 80% in total; followed by Asia and the African subregion, including Senegal, Guinea-Bissau, and Ghana. The UK and the other EU countries – i.e. Germany, France, Netherlands, and Belgium- were the major source of imports accounting for 60% of the total share of imports followed by Asia with more than 20%, as well as the Ivory Coast and other African countries.

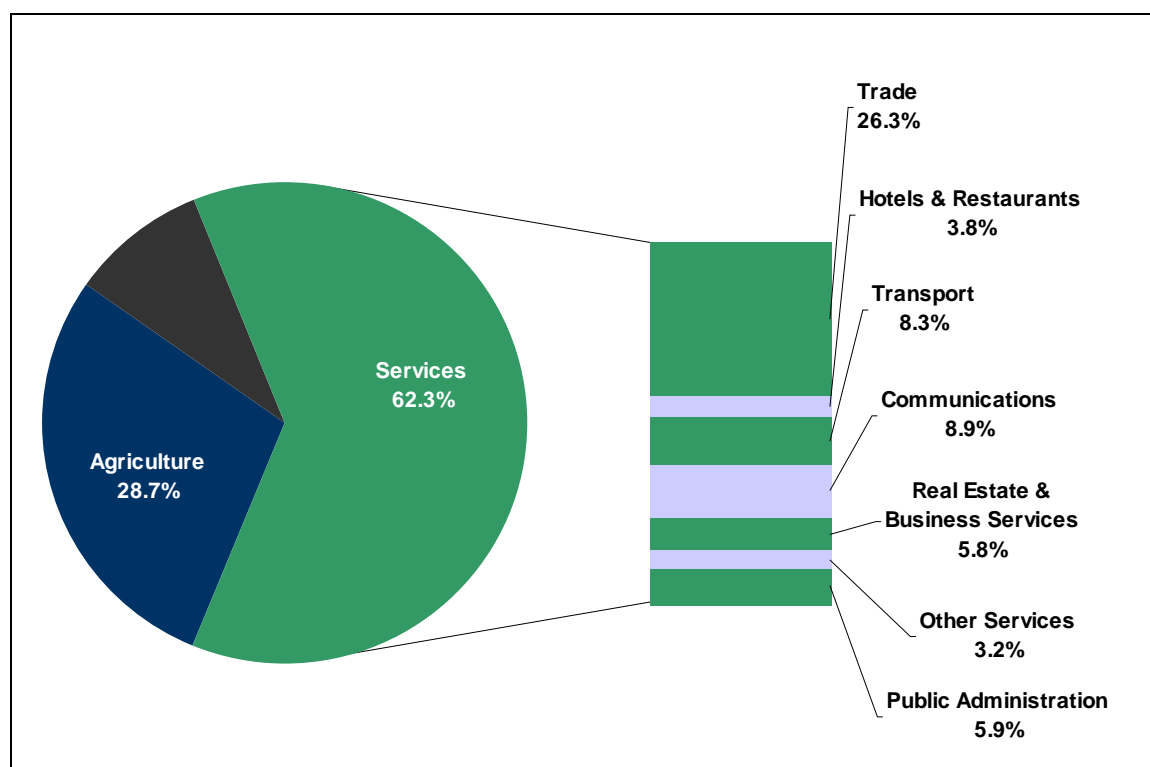


Figure 11: Contribution to GDP by Economic Activity – Focus: Service Sector (2003)

There are four major transport systems that play an important role in the Gambian Economy: via air, via sea, via road and via the river. Nevertheless, the present situation of the transport industry in the Gambia is rudimentary with little or no integration of transport modes and little industrial organisation, particularly for haulage transport. Financing of transport infrastructure is mainly borne by the Government with a burden on the public investment programme. Master plans have been drawn for each major mode of transportation, that is sea, land and air, but institutional arrangements for sustainable financing and accelerated inter-connection of transport modes are yet to be implemented.

The development of transport system infrastructure is directly linked to other service sub-sectors, in particular to the tourism branch. In recent years, the Gambia as a tourist destination has stalled in its progress. Whereas tourism had grown in surges in the 1970s, 1980s and 1990s, tourist numbers have remained below 100,000 per year for a decade. The State Department for Tourism and Culture estimates a number of 16,000 employees in the Gambian tourism branch. Nevertheless, hotels and restaurants contributed to some 3.8% of the GDP in 2003. That is less than the proportion of e.g. transport, communication or public administration sub-sectors.

4.2 EXPECTED FUTURE DEVELOPMENT

There are a range of measures going on in order to make Gambia a higher income country. These comprise for example policy reforms, rural initiatives in education and health, as well as improvements in the service sector and shall enable the Gambia to become a higher income country. Furthermore, the Gambian government has established a liberal trade regime and has thus consolidated trade links with the EU, USA, Asian countries, and the ECOWAS sub-region. With adopting the implementation of Economic Partnership Agreements, The Gambia expands its trade links with the EU, and will be getting enhanced technical assistance by the EU, which will result in a positive impact on the Gambia's economy. Another measure is the stimulation of the private sector development by encouraging increased private sector participation, in particular in industrial production.

However, the three main sectors of the Gambia's economy, Agriculture, Industry and Services, which are already described in section 4.1, have certain weaknesses, but also potential which can be expanded and thus have to be stimulated in order to increase the country's economic growth as well.

The agricultural sector currently faces many problems, which comprise low farm income, growing rural poverty, household food insecurity, accelerated rural-urban drift and rapid environmental degradation. Therefore the Government's objectives are rather reticent. For the period 2005-2010, the GDP rates for the livestock sector of 3.2% and 5% of the forestry sector are expected to stay stable, whereas the groundnut production is expected to be only 3% of the GDP.

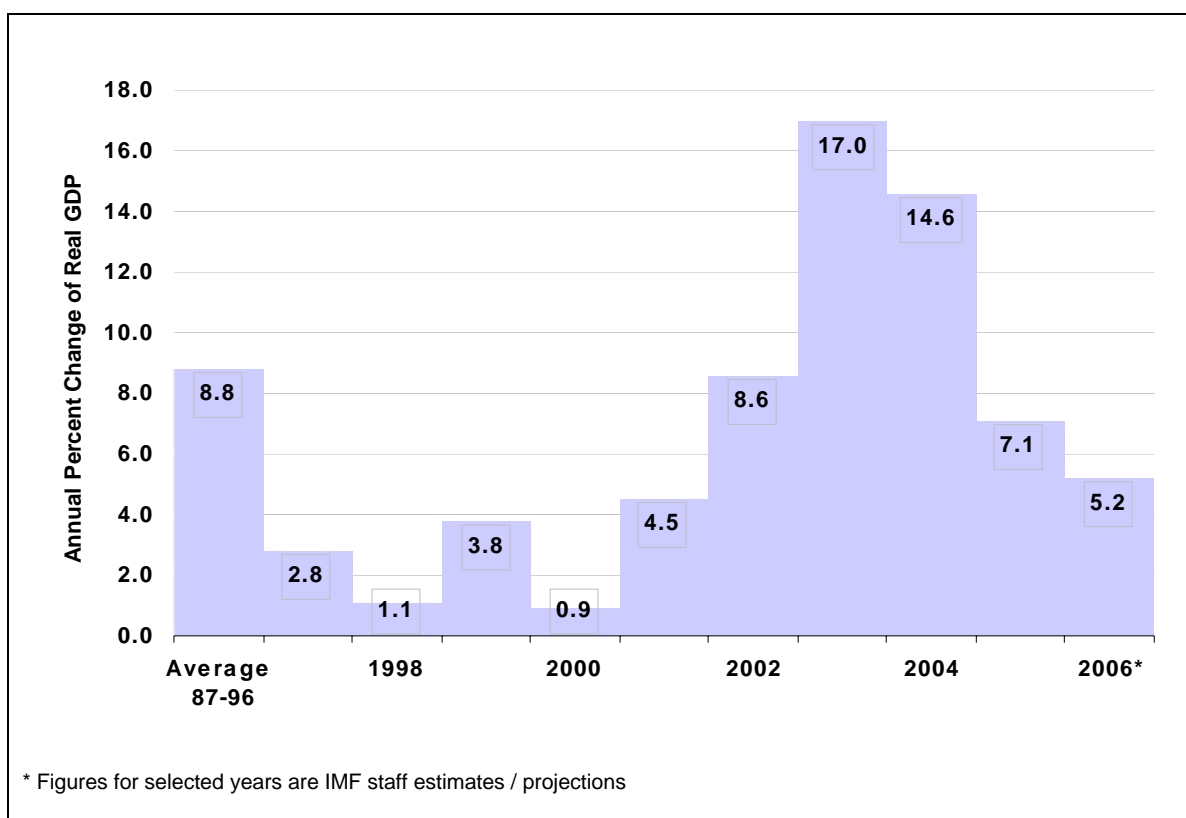


Figure 12: Annual Percent Change of Consumer Prices (1987 - 2006)

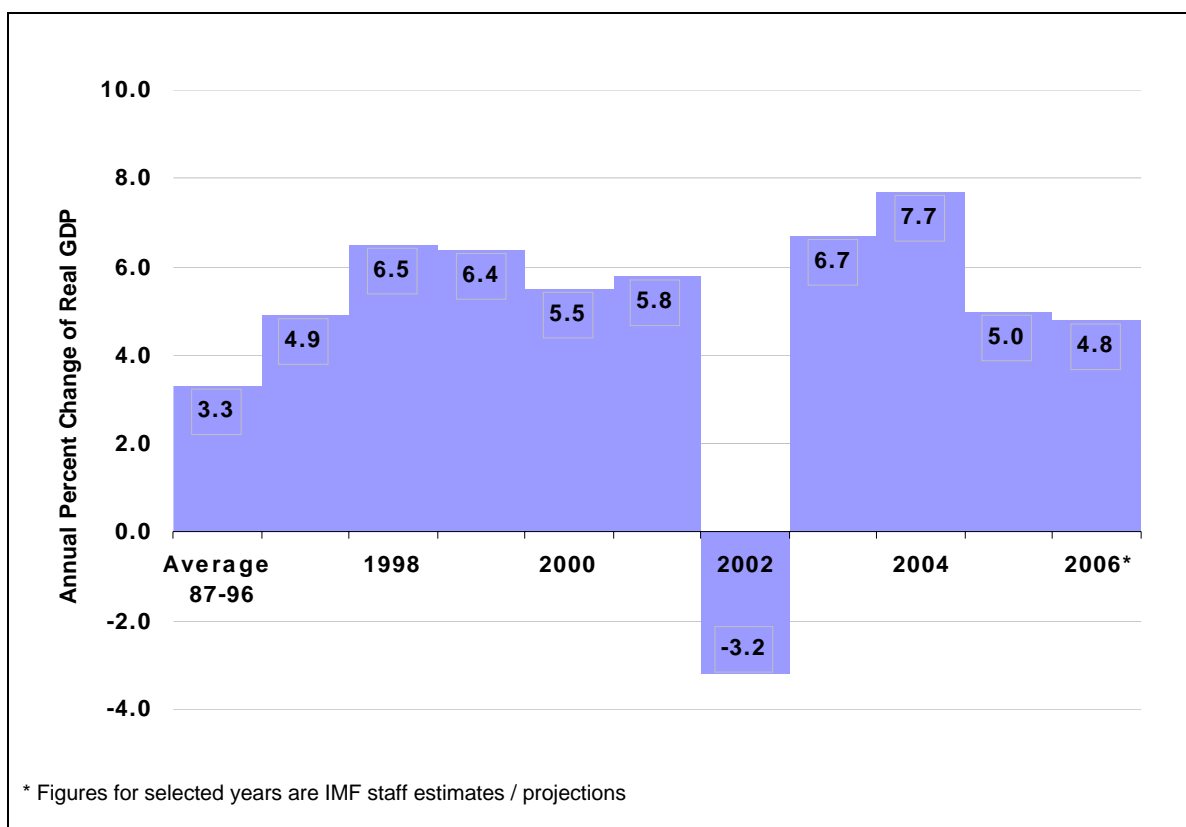


Figure 13: Annual Percentage Change of Real GDP (1987 - 2006)

In case of the fisheries sector, further development is expected and the forecast is thus an average 4.4 GDP percentage for the period of 2005-2010.

Speaking of the industry and infrastructure sector, an average GDP rate of 4.8% is expected for the period 2005-2005%. A stable annual percentage of 5% is foreseen for all of the branches of this sector during the years 2007-2010. This shall be realised for instance by employment in the manufacturing sector, which is expected to grow 4.7% in 2005-2010. This target is in conformity with the objective of improving the income status of Gambian people. Concerning the manufacturing industry, furthermore net increase in the number of industrial units, greater diversification of industry, and the capturing of an established and growing export market shall be realised by the year 2020.

Referring to other industrial branches, in one of the sources establishing economic objectives, "Vision 2020", which was published electronically in 1996 by the Gambia's government, an objective of an unlikely high increase in overall energy generating capacity is formulated. However, it is mentioned that this objective should not be overemphasised, as the primary target is to overcome the existing bottlenecks. Sufficient energy supply, the upgrade and expansion of the seaport, airport, road and waterway network and the free flow of information by the means of telecommunication and multimedia are considered as pre-requisite for the defined future economic objectives

In respect of the service sector, especially concerning the tourism industry the number of tourism visitor arrivals is expected to grow 20% annually for 10 years from 2003 on. In general, greater collaboration between the public and private sectors is envisaged in the provision of modern tourism infrastructure, but also in the other service sectors.

First projections of the percentage change of consumer prices and the real GDP are exposed in comparison with the past and current development of the Gambia's economy in Figure 12 and Figure 13. A detailed break-down for the future development of the sectors agriculture, industry and services and their branches respectively is displayed in Annex 5 of this report.

5 ASSESSMENT OF ENERGY CONSUMPTION

The Gambia relies almost entirely on biomass (wood fuels) and imported petroleum products to meet its energy requirements. However, in the face of rapid depletion of forest reserves due to bush fires, farming etc the energy options are very limited. In addition, due to high cost of imported petroleum products, the National Electricity and Water Company (NAWEC) is finding it extremely difficult to service the growing import oil bills particularly for electricity generation.

The country depends mostly on foreign aid to cover its needs of petroleum products, and as result, development efforts have been curtailed, especially in rural areas. Because of the possibility that economically exploitable deposits of petroleum exist in the Gambia, exploration is being actively pursued by the Government.

The following sections provide an assessment of the utilisation of primary energy sources such as fuelwood and the several oil products (heavy fuel oil, kerosene, diesel and liquefied petroleum gas). The present situation and historical development will be explained for each energy source. Furthermore the situation within the several consumer sectors (residential, industrial, commercial, institutional and agricultural sector) will be discussed in detail, and finally, the national energy balance is being divided.

The consumption characteristics of the secondary energy source – electricity - will be evaluated separately. Chapter 6 “The electricity consumption” addresses the conditions at the Gambia’s electricity sector.

5.1 CONSUMPTION OF FUELWOOD

Fuelwood represents the major source of domestic energy in the Gambia. The fuelwood resource-base is the forest, which covers the country constituting about 43% of the total land area⁴. It comprises the closed woodland, open woodland and savannah woodland. Fuelwood energy sources are firewood and its derived charcoal.

Cooking is the main purpose for which fuelwood is applied in the country. The evaluation of census results show that nearly 92% of the population use firewood for cooking and some 4% use charcoal. A more detailed insight into households energy requirements provides the section “Energy Consumption in the Residential Sector”.

However, fuelwood consumption in the country has been estimated at various levels by different authors with a wide range. There were several studies (Openshaw, 1973, CILSS 1977, Carlowitz 1980, Orgatec 1982, Bulow 1983, Foley 1994, Steiner 1994 and the latest Kinteh 2005) that were conducted to estimate the fuelwood demand of the country.

⁴ Source: DMCI, Development Management Consultants International.
“Household Energy Strategy for the Gambia”, 2005



Figure 14: Energy Sources / Energy Devices for Heat Generation / Cooking in the Residential Sector

The results were quite different. The consumption rate per capita varies from 1.44 m³ per capita and per annum (Openshaw, 1973) to 0.34 m³ (Foley, 1994). It is recognisable, that the consumption rate for fuelwood decreased considerably during the time when the various studies were prepared. Only the Kinteh-Study (2005) does not follow that trend. It provides a consumption rate of 1.13 m³ per capita and annum.

To apply a capable data base within this study, the Consultant refers to discussion results, as well as official data published by the Energy Division in recent years. The total fuelwood consumption is estimated at 374,890 TOE/a in the year 2004, which is equal to a specific

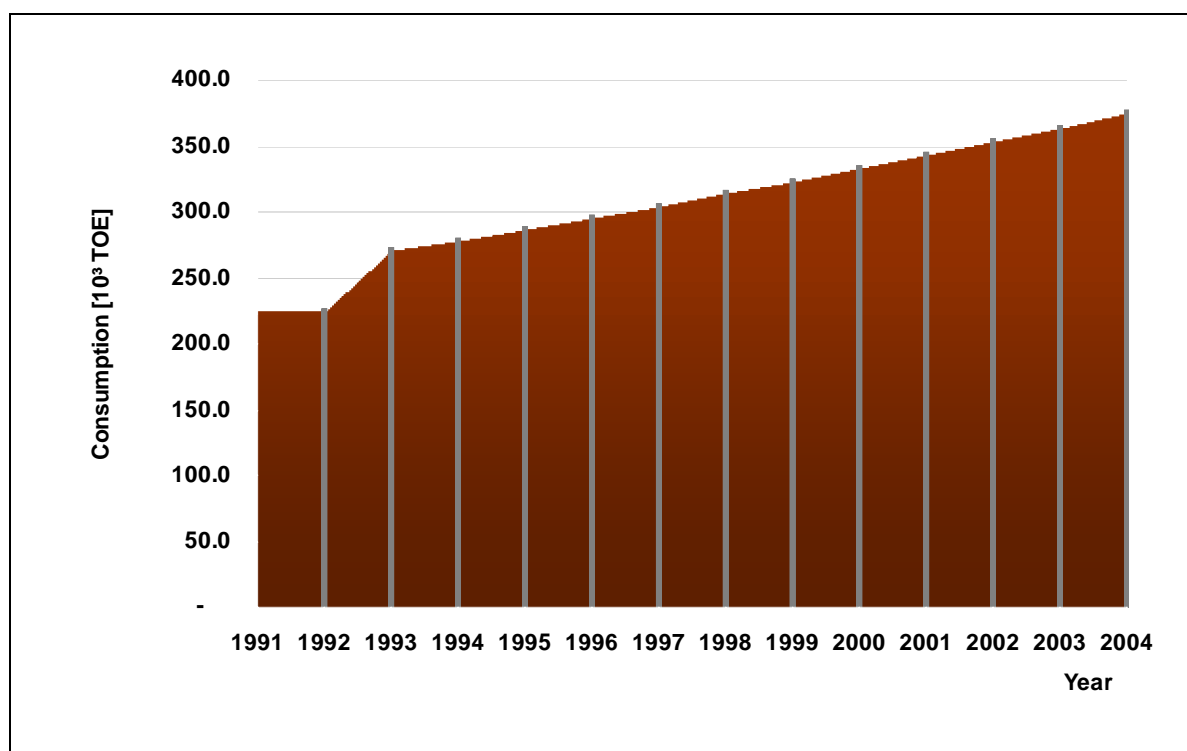


Figure 15: Development of Energy Consumption – Fuelwood (1991-2004)

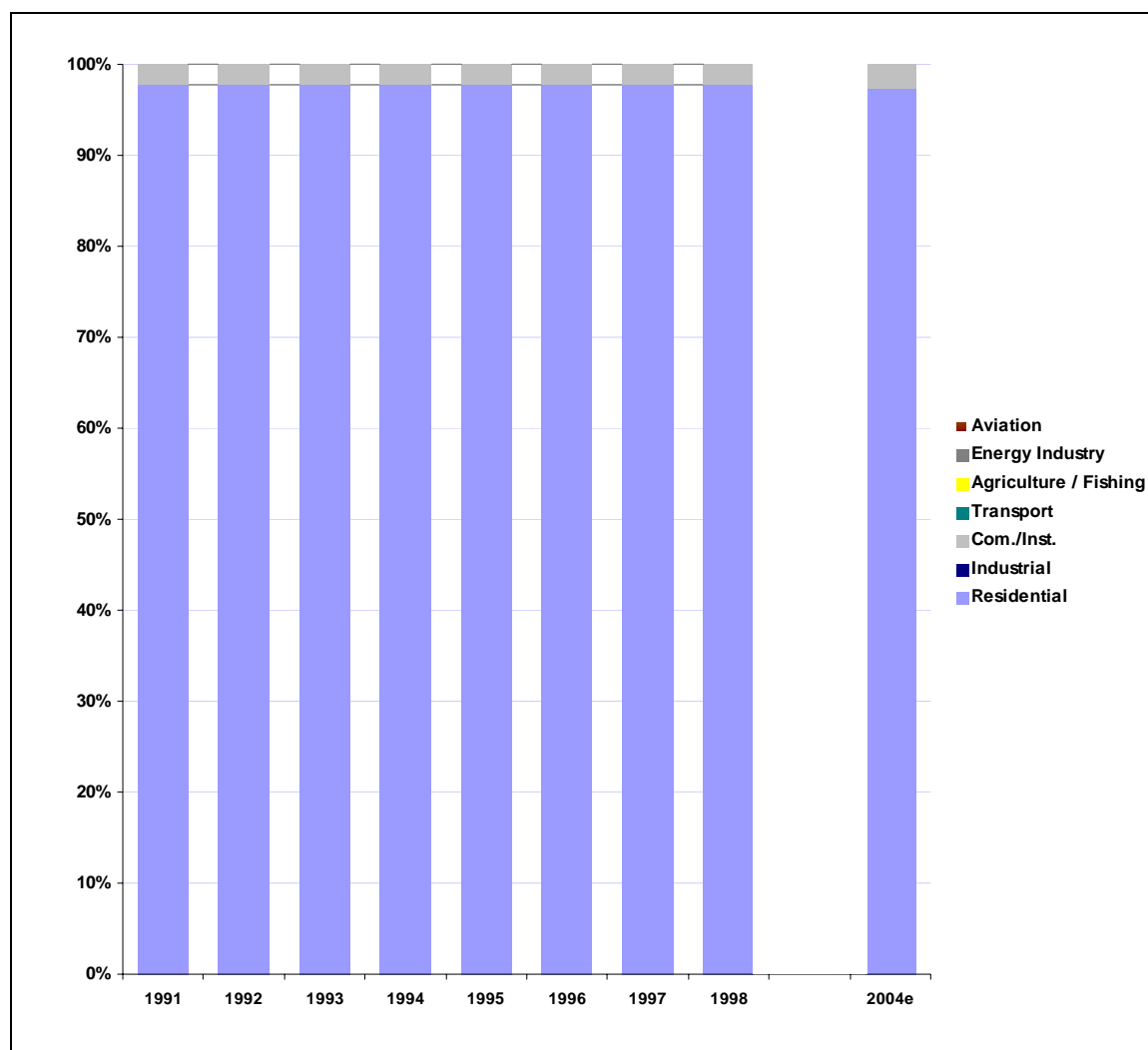


Figure 16: Development of Proportions in the use of Fuelwood

consumption of 0.27 TOE per capita and annum or 0.61 m³. Although the production and marketing of charcoal have been banned in the country since 1980, charcoal remains the leading fuel for ironing in a large proportion of households, as well as for roasting corn and groundnut and food vending operation in the streets. The Forest Act and Regulations of 1998, section 108 (1) prohibited the production of charcoal in any parts of the country but provision are made for the importation and sale of charcoal in the Gambia. The proportion of charcoal in fuelwood consumption is estimated at 5%, in absolute figures 24,900 t/a, or 18,740 TOE/a. The latest most comprehensive study in that matter (Kinteh, 2005) provide an annual consumption of 11,038 TOE/a only within the residential sector.

Figure 15 illustrates the present annual fuelwood consumption and provides a trend within the period 1991-2004. The average annual growth over the period 1991-2000 amounts to 4.4%. During the last four years, it is estimated at 3.0%.



Figure 17: Impressions of the Residential and Commercial Sector in The Gambia

Figure 16 illustrates the present sector break down and its historical development. The shares of the dominating residential sector and the commercial/institutional sector are nearly constant during the entire period under consideration. While the composition was 97.8% to 2.2% in the year 1991, for today a composition of 97.3% to 2.7 % is estimated.

5.2 CONSUMPTION OF PETROLEUM PRODUCTS

The petroleum requirements of the country consist of gasoline (premium and regular), diesel oil (gas oil), liquefied petroleum gas (LPG), heavy fuel oil (HFO), kerosene and aviation (jet) fuel. Currently petroleum products are supplied by two major international companies (Shell and Elf) and recently Castle and the start up of Elton Oil. The existing facilities for handling petroleum supplies and distribution are an oil pipeline for discharging tankers at the Banjul Port, a storage depot and over 43 retailing stations countrywide. The petroleum storage depot covers an area of about 10,500 m² situated in the heart of Banjul with a total capacity of 17,000m³.

The marketing of petroleum products is basically carried out by the petroleum companies through the retail stations owned and operated by private dealerships, which are financially independent of the marketing companies. Distribution of petroleum products is done through oil tankers for quantity imports from overseas; and in-country distribution to retailers by lorries (10 tons and above).

The consumption of liquid products grew from 74,200 TOE/a in 1991 to 112,390 TOE/a in 2004. There was a steady growth in the consumption of petroleum products. Over the period 1991-2000 the annual growth rate amounted to 2.2%. Within the last four years 2000-2004 a higher increase of some 5.7% was observed. Today the main petroleum

products are Diesel, HFO and Gasoline. Figure 18 shows the proportion in the year 2004. An overview of the development of petroleum products consumption is given in Figure 19. It shows, that in particular HFO's proportion in the petroleum product mix grew significantly in the past decades.

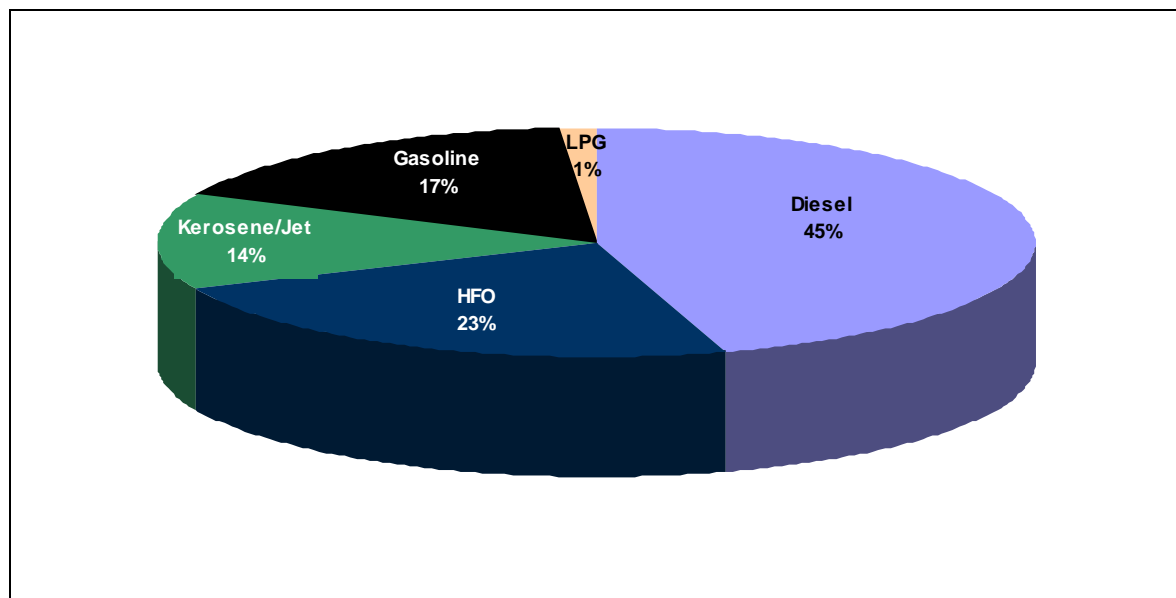


Figure 18: Composition of Petroleum Products Consumption (2004)

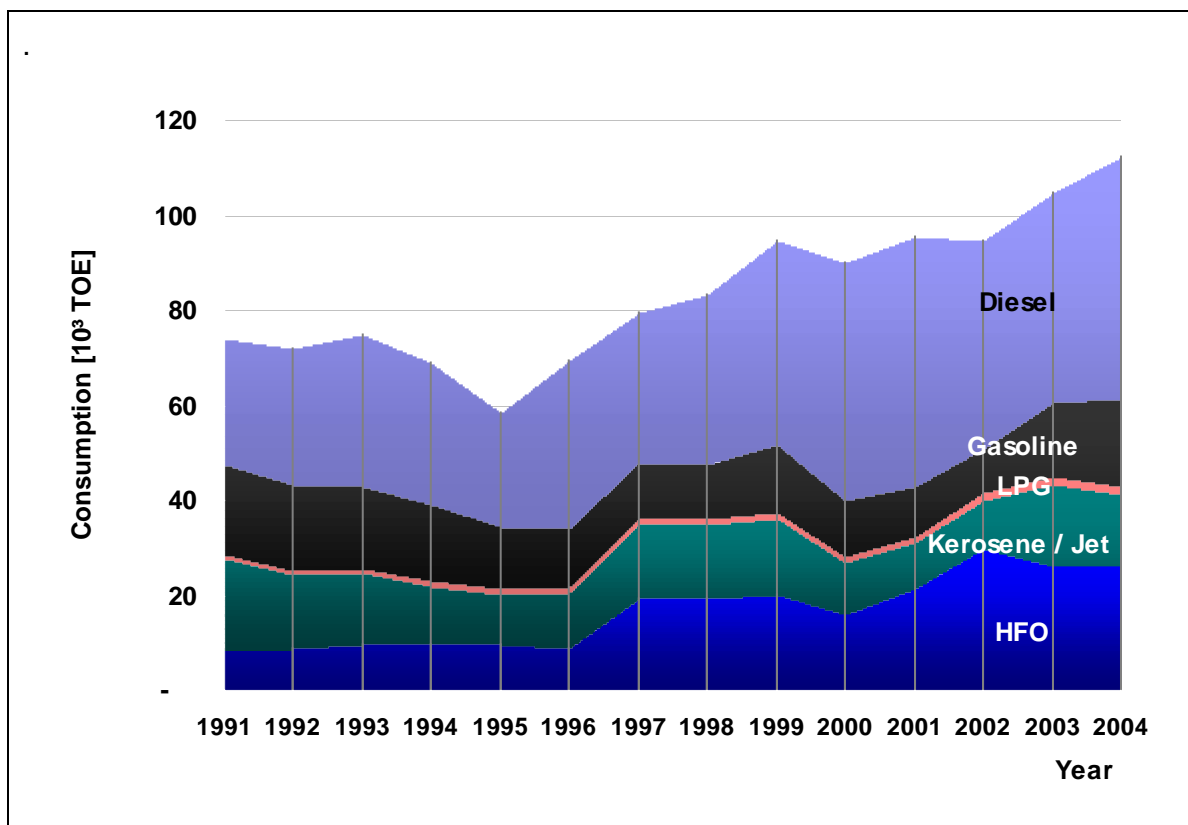


Figure 19: Development of Energy Consumption – Petroleum Products (1991-2004)

In the following the requirements for each individual petroleum product will be analysed. Beside total figures, consumption characteristics divided by customer sectors will be discussed.

5.2.1 Diesel

In 2004 about 50,790 TOE diesel fuel were consumed in the Gambia. The average annual rate of increase was 7.3% between 1991 and 2000. Diesel fuel consumption stagnated after that period. The growth rate over the past four years amounted at an average of only 0.3%.

With approximately 81% the largest share is taken up by the transport sector (including public or private transport services, private vehicles, government and diplomatic vehicles, as well as building and public works).

The country, like many other developing countries, is heavily dependent on imports of diesel fuel to generate electricity. The national utility consumed 1,610 TOE in the year 2004 (3% of total consumption). The NAWEC operates several thermal power stations that run on either diesel and/or heavy fuel oil. In recent years, NAWEC decreased significantly the proportion of diesel to generate electricity. Today heavy fuel oil is the dominating energy source in this matter by some 94%. Three years ago in 2001 the proportion even was 56%.

Sectors like industry, commercial and small parts of the residential sector apply in particular diesel fuel for stand-up or permanent self electricity generation. NAWEC experts estimate the installed capacity in those sectors by the factor 1.5 compared to it's own generation capacity. The total diesel consumption of the industrial, commercial and institutional sectors amounts to approximately 7,110 TOE/a (14% of total).



Figure 20: Impressions of the Industrial and Transport Sector in The Gambia

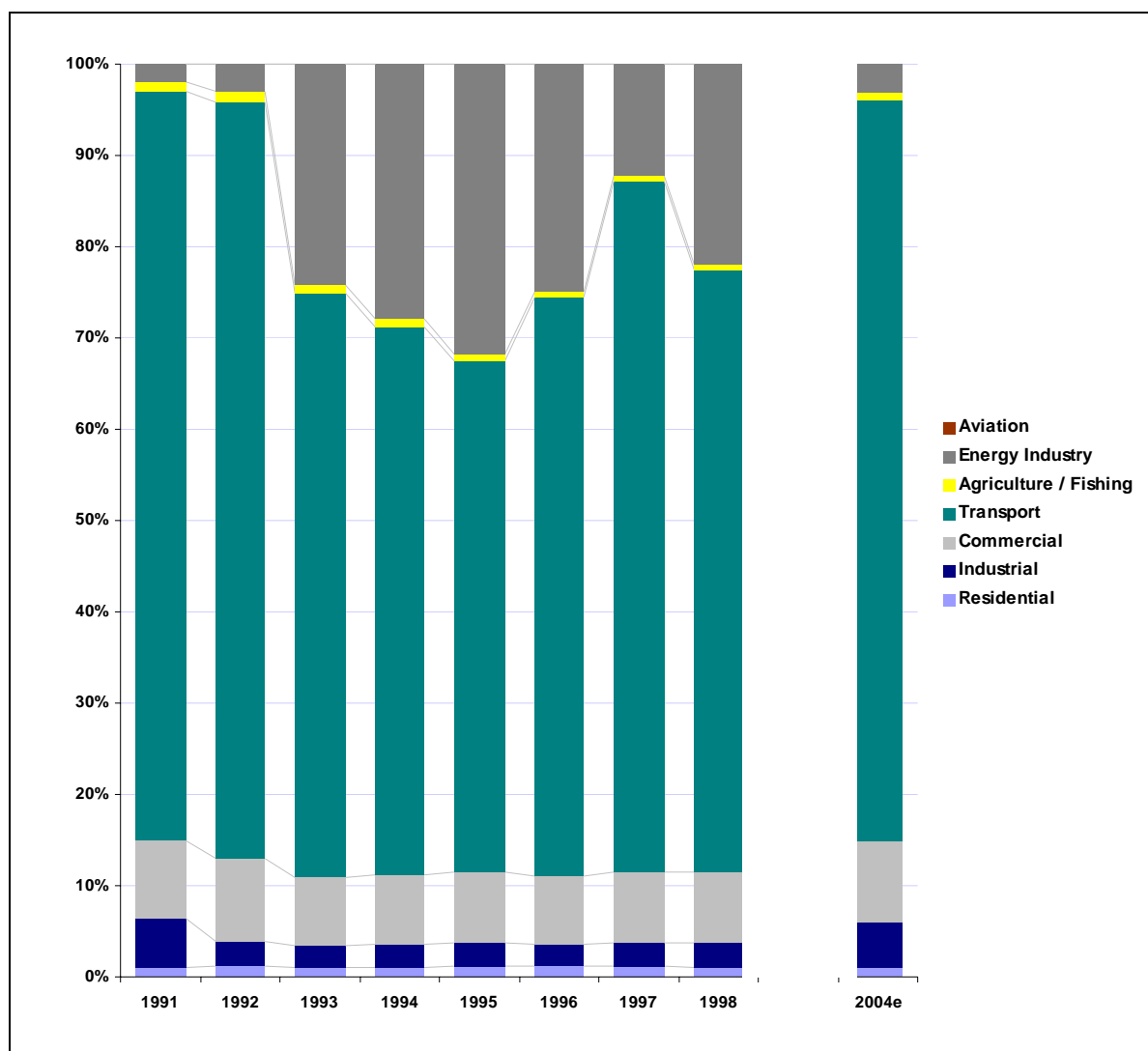


Figure 21: Development of Proportions in the use of Diesel

The above figure illustrates the sector breakdown in terms of diesel fuel use. Remarkable is the interplay between diesel consumption within the energy industry and transport sector. Based on available data and discussions with energy division's expert the breakdown for the present situation was estimated as follows:

- Residential Sector: 1 %
- Agriculture and Fishing Sector: 1 %
- Industry incl. Energy Industry: 8 %
- Commercial and Institutional Sector: 9 %
- Transport Sector: 81 %

5.2.2 Heavy Fuel Oil

In 2004 about 26,070 TOE heavy fuel oil were consumed in the Gambia. The average annual growth rate was 7.6% between 1991 and 2000. HFO consumption further rises very drastically. HFO is that energy source with the highest rate of increase in the past. Over the past four years average annual change amounted at 13.2%!

With a share of about 98% the energy industry plays the dominating role in the use of heavy fuel oil. As already described within the previous section, NAWEC has substituted more and more the fuel input in its power stations by HFO instead of diesel. In addition, new power generating units started operation at the end of the nineties and the beginning of that millennium (commissioning year 1997: TPP Kotu unit 3 and unit 11; commissioning year 2001: TPP Kotu unit 4R, unit 7 and unit 8). The impact of units' commissioning is clearly recognisable in Figure 22, which shows the development of HFO consumption over the period 1991 up to 2004.

At present the energy industry alone requires 25,500 TOE/a of HFO. The remaining amount is exclusively used by the industrial/manufacturing sector, with nearly 510 TOE/a. The proportion of HFO consumption by sector is shown in Figure 23. The figure illustrates that the consumption caused by the energy industry increased more and more over the past 15 years. The ratio of energy industry consumption to total consumption increased from 93% in 1991 to 98% in 2004.

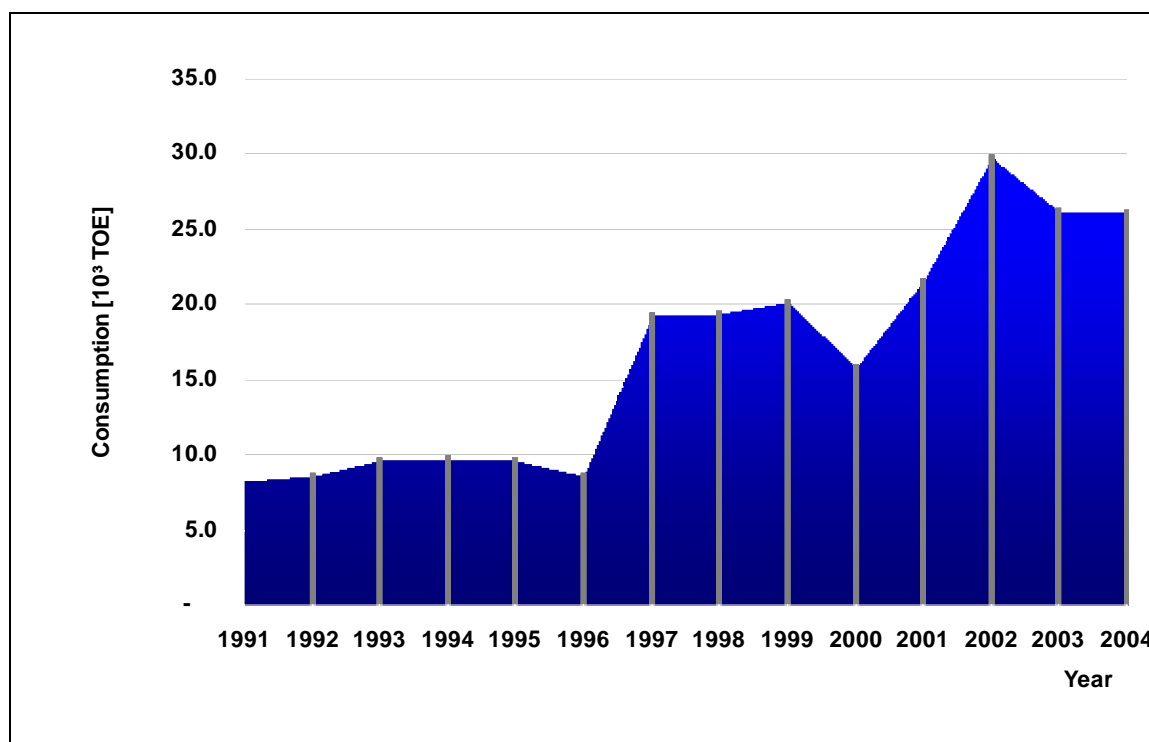


Figure 22: Development of Energy Consumption – Heavy Fuel Oil (1991-2004)

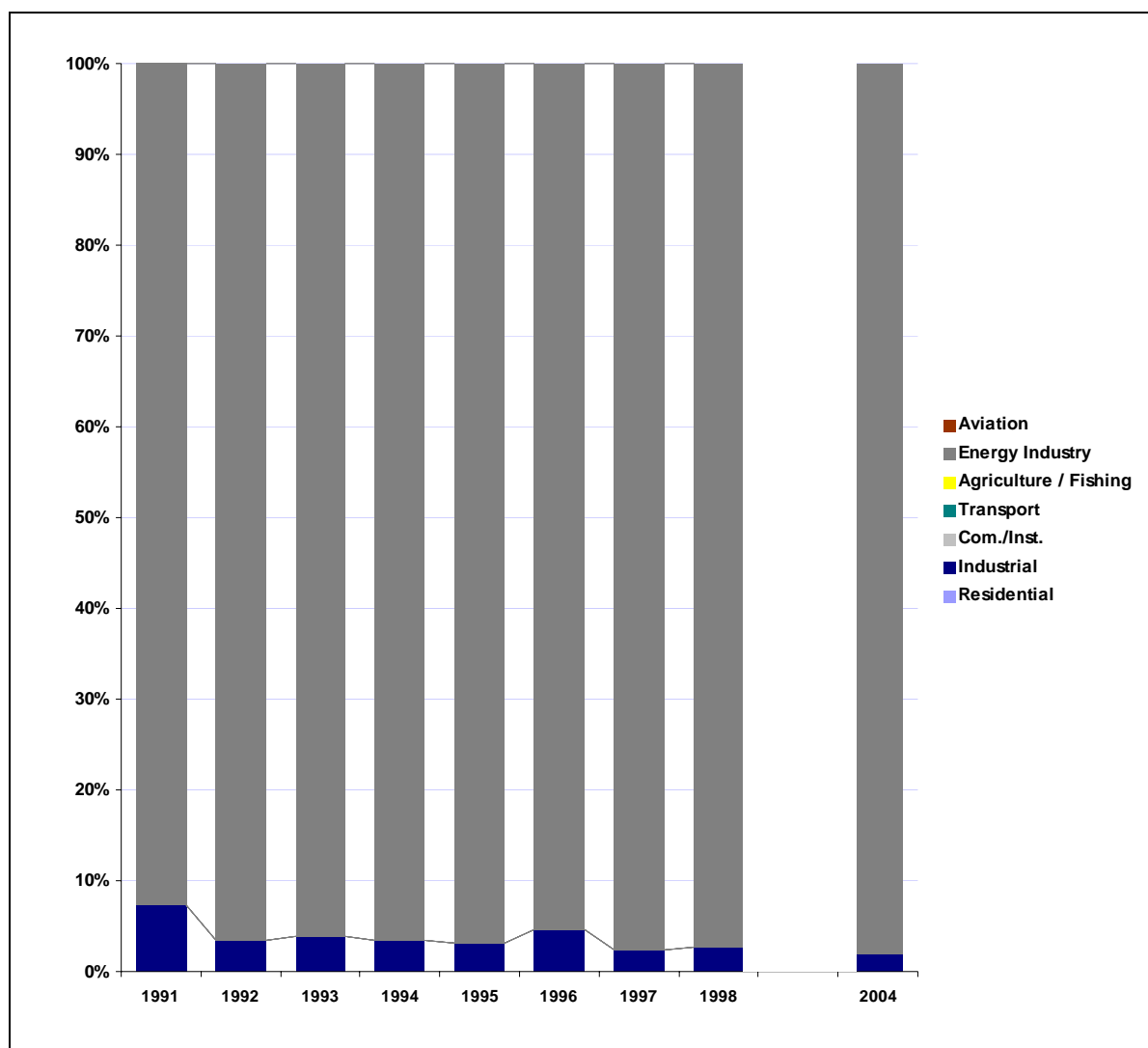


Figure 23: Development of Proportions in the use of HFO

5.2.3 Gasoline

Behind Diesel and HFO, Gasoline ranks on third place within the frame of petroleum products consumption with a share of 17%. In 2004 approximately 18,600 TOE of gasoline were consumed in the Gambia. Between 1991 and 2000 a reduction of gasoline consumption is observed. During this period, the average annual change was -5.2. In 1991, nearly 19,000 TOE were used almost exclusively by the transport sector. Over the years the consumption of gasoline dropped to the half of the amount by 1991. Only 11,690 TOE have been the annual consumption in 2000, and the minimum with some 9,420 TOE was reached in 2002. In recent years, gasoline consumption jumped by two-digit annual growth rates. During the years 2003-2004, the rate of increase was 18.8%.

Figure 24 below gives an insight into the sectoral consumption of gasoline. Naturally, the transport sector is dominating. In 2004, the proportion amounted to 95%. With about 4%

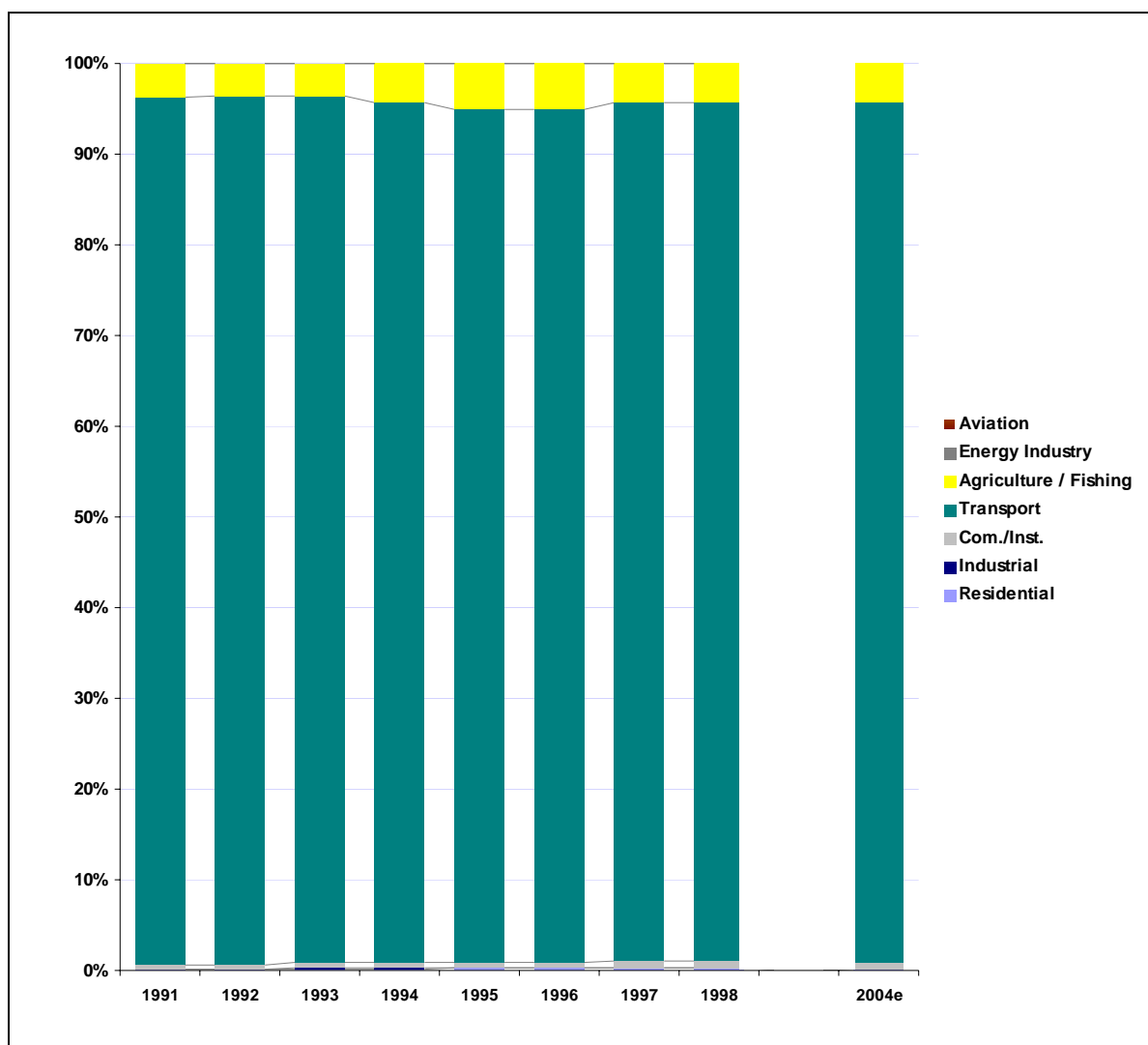


Figure 24: Development of Proportions in the Use of Gasoline (1991-2004)

the transport sector is followed by agriculture and fishing. The remaining small share is caused by the commercial, institutional and residential sector.

5.2.4 Kerosene and Jet

In 2004 about 15,350 TOE of Kerosene / Jet were consumed in the Gambia. The fuel can be divided into two kinds of application:

- Kerosene, which is 100% applied in the residential sector; and
- Jet fuel, which is 100% applied for aviation.

Kerosene is mainly used for lighting. Attempts to promote improved kerosene oven for cooking resulted in only marginal market penetration. Kerosene is one of the most important energy sources for lighting in *rural* households, as these do not have access to electricity. The amount of kerosene consumption in 2004 is estimated at 5,770 TOE, about 38% of total kerosene / jet consumption.

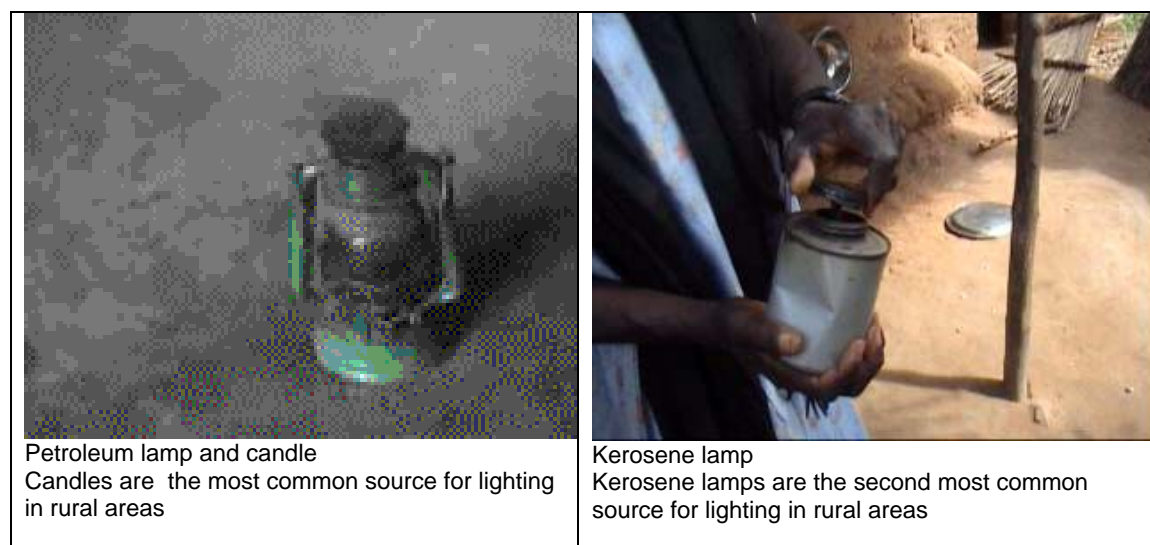


Figure 25: Energy Sources / Energy Devices for Lighting in the Residential Sector

In the past, several fluctuations in the use of Kerosene/Jet were observed, mainly caused by the consumption characteristics of the transport sector (aviation). Over the period 1991 to 2000, the average annual change was -6%. In that period, the minimum was reached in the year 1995 with some 10,520 TOE/a. The maximum was observed at the beginning of this decade in 1991. Approximately 19,350 TOE/a were used during this year. Over the last four years, the average annual change amounted to 8.4%. Figure 26 below shows the development of Kerosene / Jet consumption over the period 1991 to 2004.

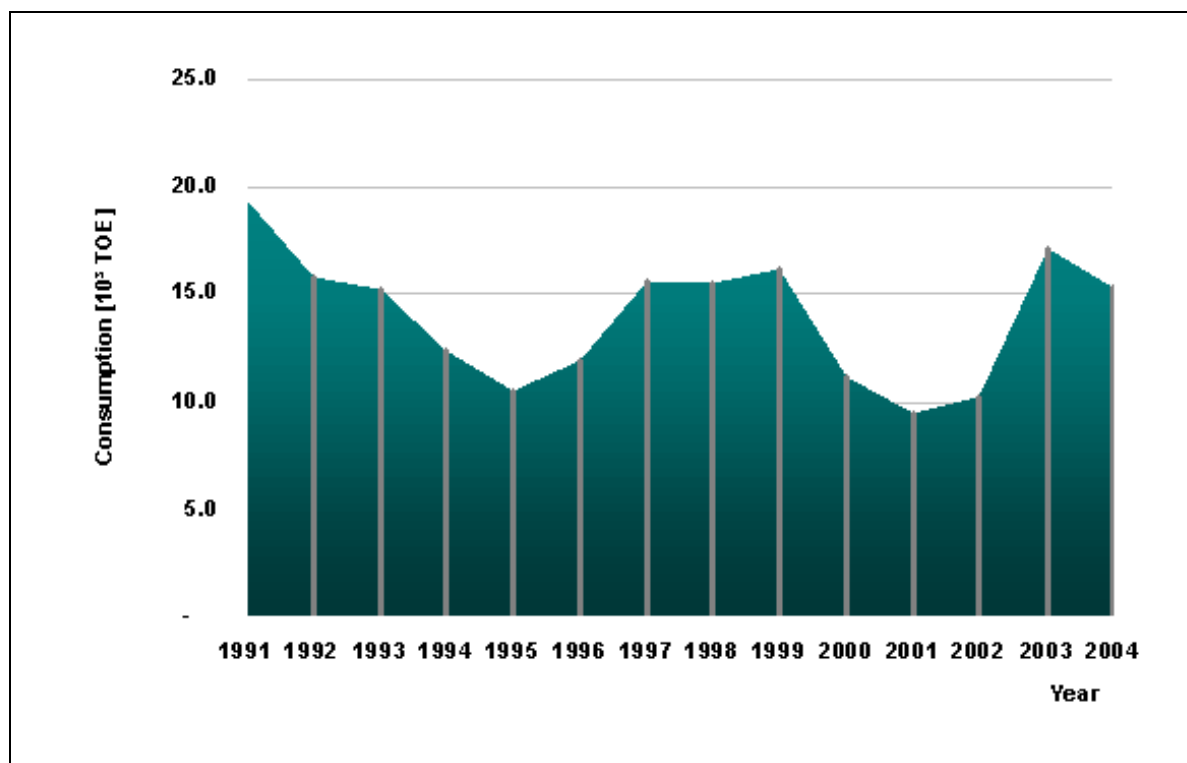


Figure 26: Development of Energy Consumption – Kerosene / Jet

5.2.5 Liquefied Petroleum Gas

The total consumption of liquefied petroleum gas (LPG) is estimated at 1,590 TOE/a in the year 2004. LPG is used for cooking and heat generating purposes. It is imported from Senegal and transported by land. The oil companies have withdrawn leaving the gas companies and the informal sector operators in the market. These companies are Gam Gas, M&C Gas and Touba Gas. The lack of adequate infrastructure resulting in small parcels of imports has led to the slow pace of market penetration. An EDF funded project (Butane Gas Project) to promote the use of LPG as an alternative to firewood during the first half of the 1990s has had very limited results. Nevertheless, the average annual growth rate of LPG consumption was 7.3% between 1991 and 2000. Over the past four years the annual consumption was nearly stable. A growth rate of some 0.3% was observed during the period 2000-2004.

Figure 27 below presents the quantities of LPG used between 1991 and 2004. The figures are based on analyses of import figures and estimations by LI and the Gambia's Energy Division. As shown in the graph, annual consumption has nearly doubled within the last fifteen years. A break down by sector is presented in Figure 28. No significant change of the proportions is registered. The commercial/institutional sector causes 40%, the remaining 60% contributes the residential sector.

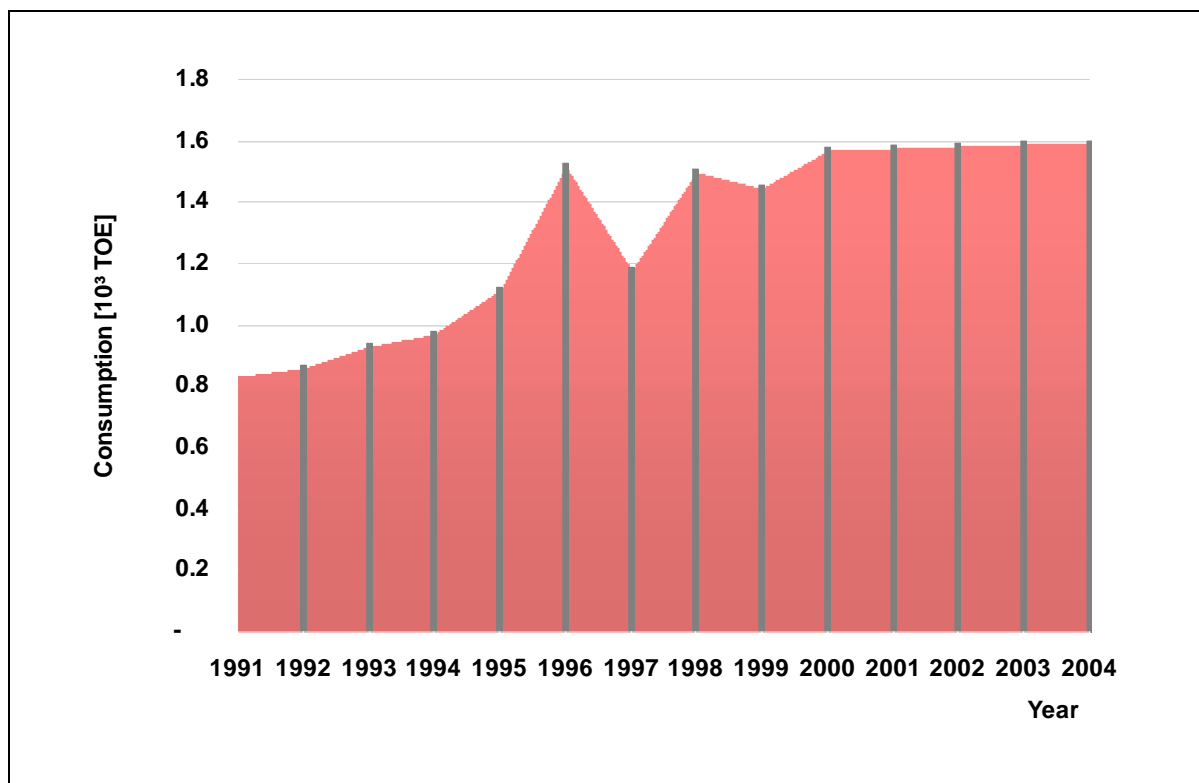


Figure 27: Development of Energy Consumption – LPG

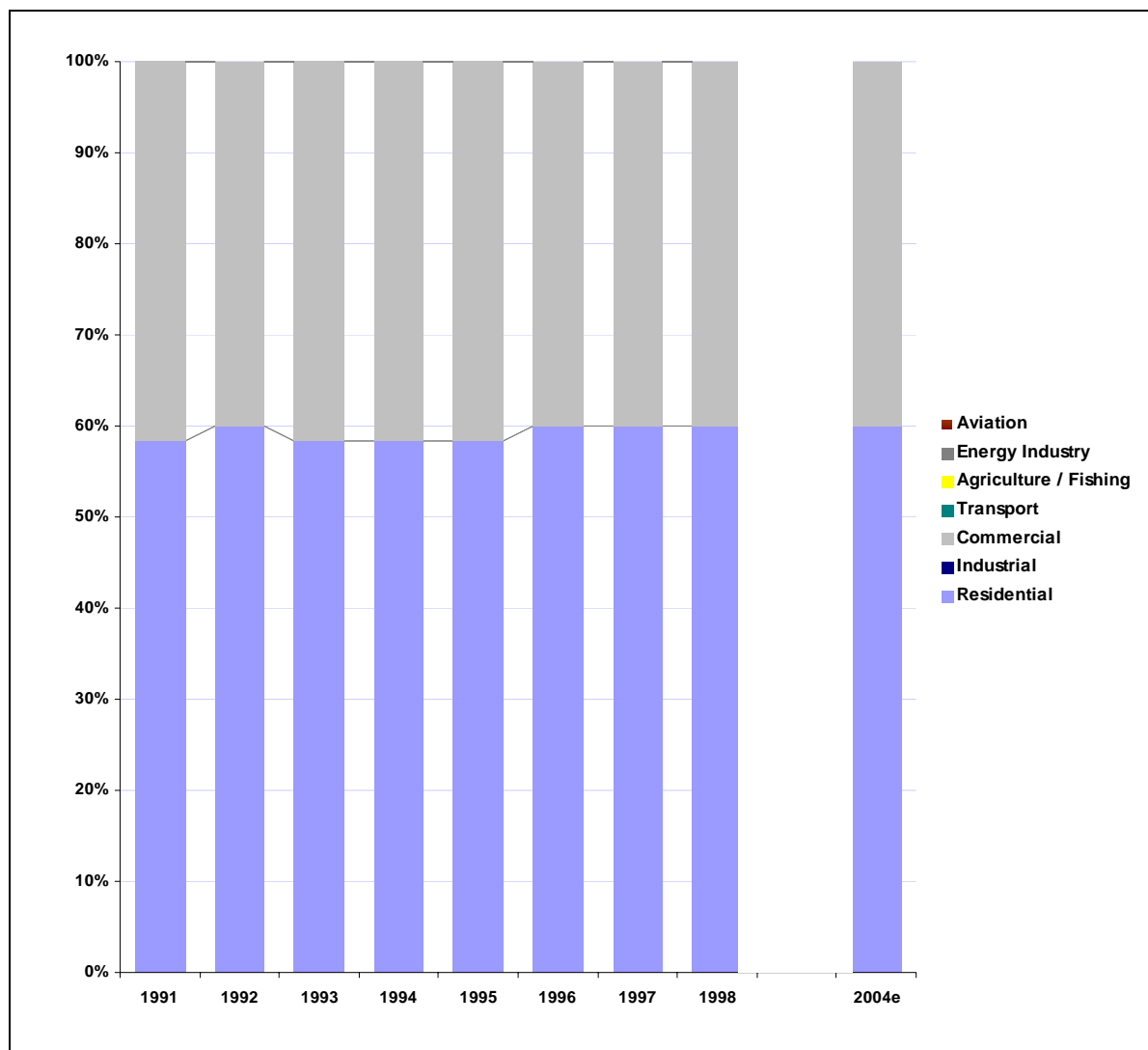


Figure 28: Development of Proportions in the Use of LPG

5.3 URBAN AND RURAL CHARACTERISTICS OF ENERGY REQUIREMENTS

Before discussing the regional characteristics (in particular urban and rural area diversification) this section explains the consumption of primary energy sources by sector. Within Annex 5, a detailed overview concerning this matter is provided.

The **residential sector** is the sector with the highest primary energy consumption compared to all other sectors. This is due to the high consumption of fuelwood with approximately 378.3 thousand TOE/a. The use of fuelwood amounts to more than 98% of the sector's total primary energy requirements. Diesel contributes only 0.1%, Kerosene 0.9% and LPG 0.3%. Due to its dominating role in the Gambian energy system, the Consultant has assessed comprehensively the characteristics of energy application for the main energy-intensive household activities. The following results are mainly based on the latest evaluations of the Central Statistics Department of the Gambia. Furthermore, it should be borne in mind, that the following figures do not only consider primary energy sources like in all previous sections of this chapter. Because of

the fact, that energy consumption surveys consider the demand side (the end of energy supply chain) also secondary energy sources, such as electricity or candles, are included in the following compilations.

The most energy-intensive activity in households is cooking. About 92% of households in urban areas use fuelwood for that purpose (84.5% firewood, 7.5% charcoal). In rural areas the proportion is even larger, with some 99% (98.6% firewood, 0.5% charcoal). While gas use can be noted at least as recognisable in urban places, other energy sources in rural areas show per-mill-ranges. Table 8 gives an overview for urban and rural areas of the Gambia. In addition, Annex 6 provides detailed figures for each the legal and the administrative area, described in Section 3.1.

Large differences in urban and rural areas are observed in the use of energy sources for lighting. First of all, the major source is the same, 47.1% of urban households, and 51% of rural households use candles. In urban regions, candles are followed by electricity. Electricity is supplied by NAWEC (more than 40% of households), conventionally self-generated

**Table 8: Use of Energy Sources for Cooking in Urban and Rural Areas
(Finalised Results of Census 2003)**

Total	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	686,090	84.54%	0.29%	0.10%	7.50%	6.64%	0.07%	0.02%	0.85%
Rural	674,568	98.62%	0.22%	0.16%	0.48%	0.47%	0.00%	0.03%	0.00%



Figure 29: Impression of Cooking in Households

**Table 9: Use of Energy Sources for Lighting in Urban and Rural Areas
(Finalised Results of Census 2003)**

Total	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	686,090	40.2%	1.5%	10.3%	47.1%	1.0%	0.0%
Rural	674,568	1.0%	0.8%	45.1%	51.0%	1.6%	0.6%

(1.5%) or generated by solar PV-systems (1%). In rural households, kerosene lamps rank on second place. More than 45% of the households use simple kerosene lamps for lighting purposes. Other sources such as electricity and firewood take a marginal share. Table 9 shows the country-wide proportions. In detail, Annex 6 gives an overview of all local and administrative areas in the Gambia.

The use of energy sources in the **industrial sector** (including energy industry) is nearly limited to the consumption of diesel and heavy fuel oil. Almost 14% of total consumption in the sector is allocated to diesel, and the remaining 86% to HFO. Industrial customers are to 100% located in urban agglomerations, and an estimated proportion of 90% alone in the Greater Banjul Area.

A similar regional classification is applied for the **commercial / institutional sector**. Major institutional and commercial facilities are situated in the capital Banjul. Smaller institutions of local authorities belongs to urban areas. Small-scale commercial places, as well as primary and secondary schools can be found in each part of the country. Fuel-



Figure 30: Impression of Industrial and Institutional Sector in the Gambia

wood dominates the energy use in this sector, with a share of 65.5% of the total primary energy consumption. Fuelwood is followed by diesel (29.6%), liquefied petroleum gas (4.1%), and a neglectable proportion of gasoline (0.8%).

The **agricultural sector** (including fishing) shows a reverse regional composition. In recent years, agricultural output declined in urban areas (in particular in the Greater Banjul Area due to limitation and reduction of farmland). Major primary energy sources used in the agricultural sector are fuels like diesel (30.4%) and gasoline (69.6%). The level of mechanisation in the agriculture is very low. Many of agricultural activities are still carried out by manpower. Therefore, the agriculture sector is the sector with the lowest energy input compared with all other consumer groups. Furthermore, the energy consumption per region is quite different. Table 10 shows the number of machines / devices per rural area in the different Local Government Areas. These figures are the results of the 2003/2004 national agricultural sample survey published by the Agricultural Statistics and Resources Economics Unit (ASRE) in 2004. They provide an indication of mechanisation and related energy use within the regions analysed.

Table 10: Tools and Implements used by crop fields planting / harvesting by LGA (2003)

Local Government Area / District	Tractor	Electric Motors	Power Tillers	Threshing Equipments	Other Machines	Groundnut Lifter	Cart	Other
NATION-WIDE RURAL AREAS	2,369	466	100	316	691	77,182	191,583	200,718
LGA OF BRIKAMA	959	150	100	316	-	5,934	23,740	45,997
LGA OF MANSAKONKO	457	-	-	-	660	2,909	13,577	26,184
LGA OF KEREWAN	162	316	-	-	-	26,955	47,172	32,010
LGA OF KUNTAUR	129	-	-	-	-	13,772	31,478	20,985
LGA OF GEORGETOWN	212	-	-	-	31	18,201	36,403	33,192
LGA OF BASSE	450	-	-	-	-	9,411	39,213	42,350

Source: 2003/2004 National Agricultural Sample Survey, Agricultural Statistics and Ressources Economics Unit (ASRE), et.al.



Figure 31: Impressions of the Agriculture Sector in The Gambia

The **transport sector** covers the energy sources diesel, gasoline and jet. The latter type is applied exclusively in the Gambia's aviation with the country's gateway the Banjul International Airport. Jet consumes 16.9% of the total energy in the transport sector. Other transport sub-sectors, such as road transport; maritime and river transport, are also concentrated in the Greater Banjul area. The major sources are diesel (58.2% of total sector requirements) and gasoline (24.9% of total). It is estimated that 85% of the transport activities take place in the urban agglomerate around the capital, the remaining 15% in country's provinces.

5.4 SEASONAL CHARACTERISTICS OF ENERGY REQUIREMENTS

This section describes the seasonal and monthly characteristics of primary energy consumption. First the main climatic conditions, which can influence seasonal energy use will be explained.

The Gambia lies in the Sahelian agro-climate zone and has perhaps the most agreeable climate in West Africa. There is subtropical climate with distinct dry and rainy seasons. The dry season is from November to May with temperatures as low as 16°C in Banjul and surrounding areas, and the Harmattan wind keeping the humidity low. Daytime temperatures may rise as high as 41°C between March and June. The rainy season is from June to October with hot, humid weather; during this period, average temperatures range from 23°C up to 32°C. In general, there is considerable cooling off in the evening. The mildest temperatures are along the coastline.

Average annual rainfall on the coast amounts to 1.45 mm, while less rain is falling in inland that with about 92 mm. Even in the rainy season, sunny periods occur on most days. There has been a steady decline in rainfall from 1,875 onwards, which still continues and which is causing increased salinity in the lowlands and increased aridity in the uplands.

Table 11: Average Climatic Conditions in The Gambia (Banjul)

Month	Temperature Average		Discomfort from heat and humidity	Relative humidity		Average Precipitation (mm)	Wet Days (+2.25 mm)
	Min	Max		am	pm		
Jan	15	31	Medium	67	27	3	0.1
Feb	16	32	Medium	66	26	3	0.3
Mar	17	34	Medium	76	29	0	0
Apr	18	33	High	82	41	0	0
May	19	32	High	88	49	10	0.9
Jun	23	32	High	91	61	58	5
Jul	23	30	High	94	72	282	16
Aug	23	29	High	95	78	500	19
Sep	23	31	High	95	73	310	19
Oct	22	32	High	95	65	109	8
Nov	18	32	Medium	90	47	18	0.8
Dec	16	31	Medium	77	36	3	0.2

SOURCE: bbc.co.uk WORLD WEATHER COUNTRY SIDE GAMBIA

Table 11 above summarises selected parameters of the climatic conditions, such as average temperatures and rainfall over a period of one year. Weather conditions can influence the output of the agricultural sector and the related energy consumption. Referring to this also the energy consumption of related sectors such as transport, but in particular agricultural product processing industry can be influenced by fluctuations in temperature or rainfall.

In many countries the residential sector is that sector with the highest dependence of seasonal energy consumption on climatic conditions. This is due to space heating in cold seasons and/or air conditioning in hot seasons. Space heating is not relevant in the Gambia, and also the use of air conditioning devices is marginal. Furthermore the fluctuation of monthly average temperatures are very low, as illustrated in the following graph. The comparison of average maximum values show a difference of only 5 Kelvin (34°C in March; 29°C in August). Even if the use of air conditioning devices would increase, no drastically seasonal fluctuations would occur.

Another important determinant of daily, monthly or seasonal consumption figures is the number of hours per day between sunrise and sunset. In European countries for example the difference between maximum and minimum is very high (e.g. in Germany it varies

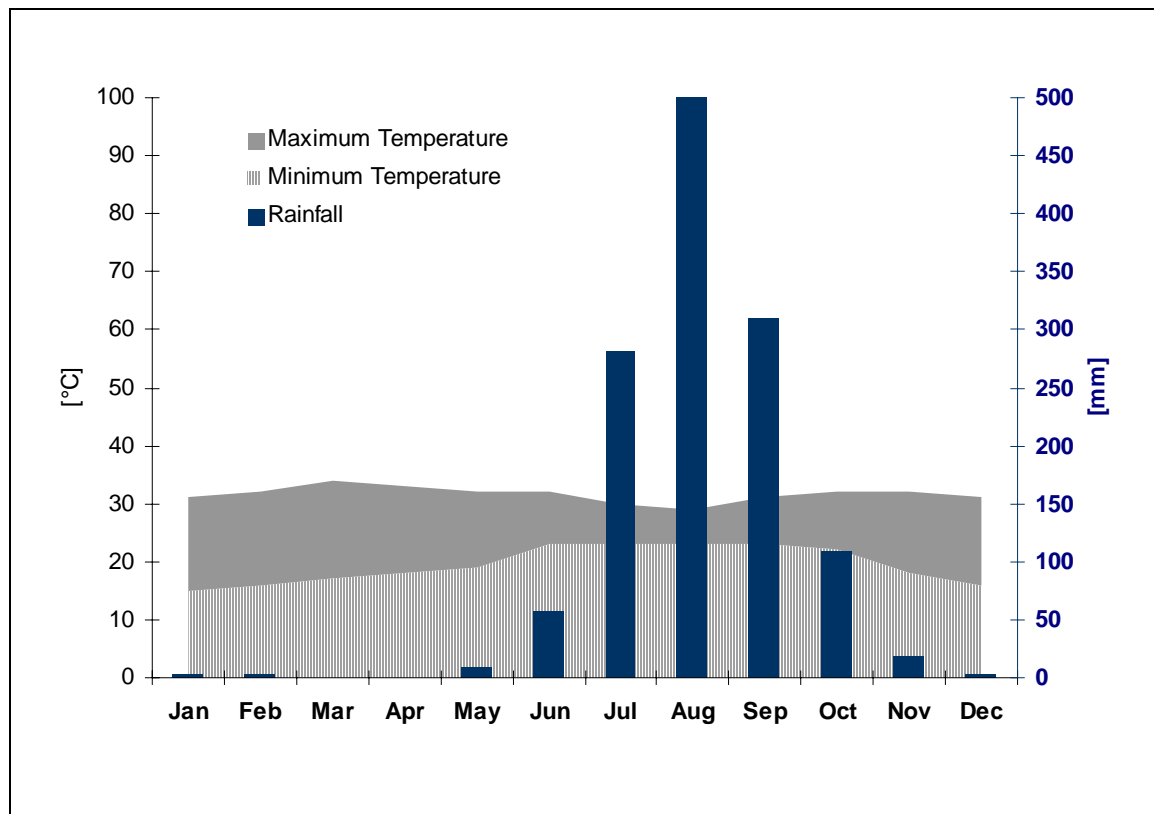


Figure 32: Temperature and Rainfall Profile in The Gambia (Banjul)

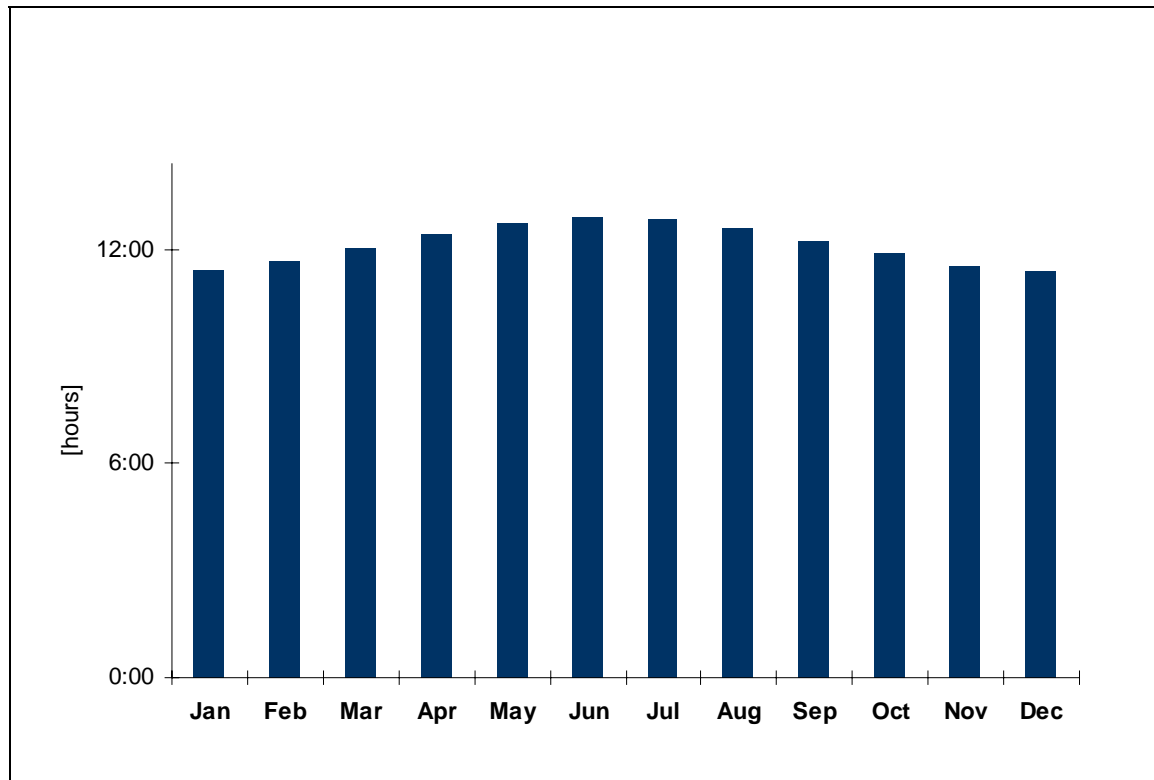


Figure 33: Average Number of Hours between Sunrise and Sunset

between less than 8 hours a day during winter and more than 16 hours a day during summer). Energy use for lighting increases drastically during periods with short times of daylight. In the Gambia the number of hours between sunrise and sunset fluctuates not significantly. Figure 33 shows the profile over the year. The maximum is observed in June/July with about 12:50 hours. The minimum occurs in December/January and amounts to 11:20 hours. Deviations from the overall average (12:05 hours) are low, with only about 45 minutes. Concerning this matter, no important fluctuations are expected in terms of monthly / seasonal energy consumption.

Certainly, agriculture's harvest time and tourism branches' peak period have an impact on the monthly consumption of energy. But due to the low proportion of these (sub-) sections the impact on the overall requirements is quite low.

The following graphs show the monthly profiles for the main primary energy sources. The figures are based on sales and supply statistics and are presented non-dimensionally (100% values are equal to the maximum monthly figure for each energy source). The graphs show that there is no actual returning seasonal pattern. Within the "diesel graph" (Figure 35) an additional comparison of 2004 and 2003 values is presented. Again, no typical seasonal pattern can be pointed out.

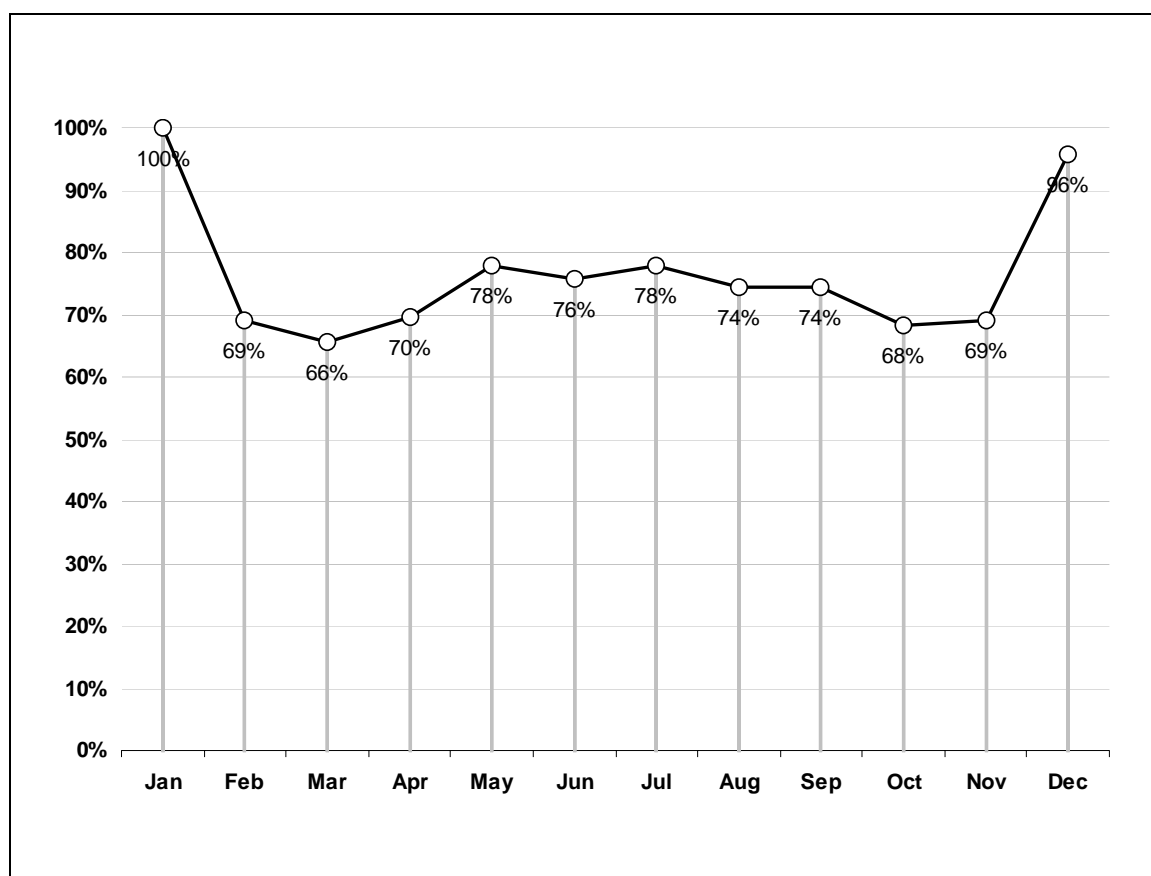


Figure 34: Monthly Requirements of Heavy Fuel Oil (2003-2004)

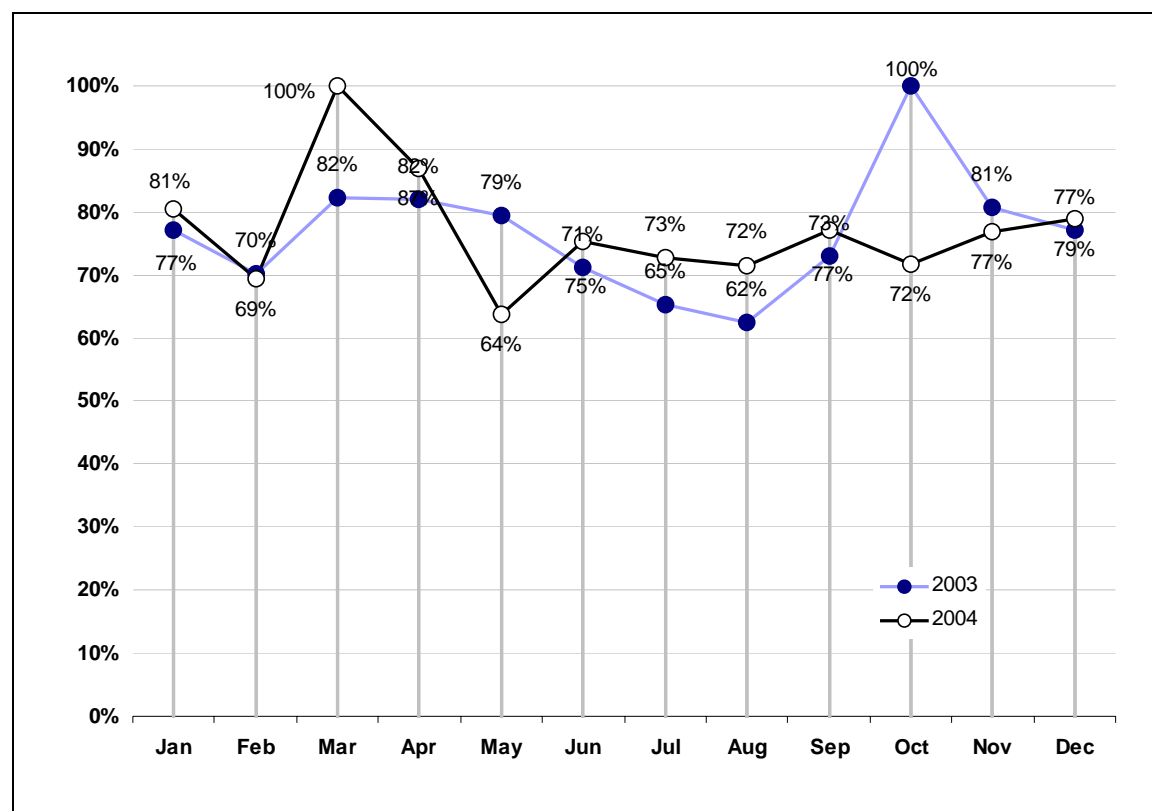


Figure 35: Monthly Requirements of Diesel (2003-2004)

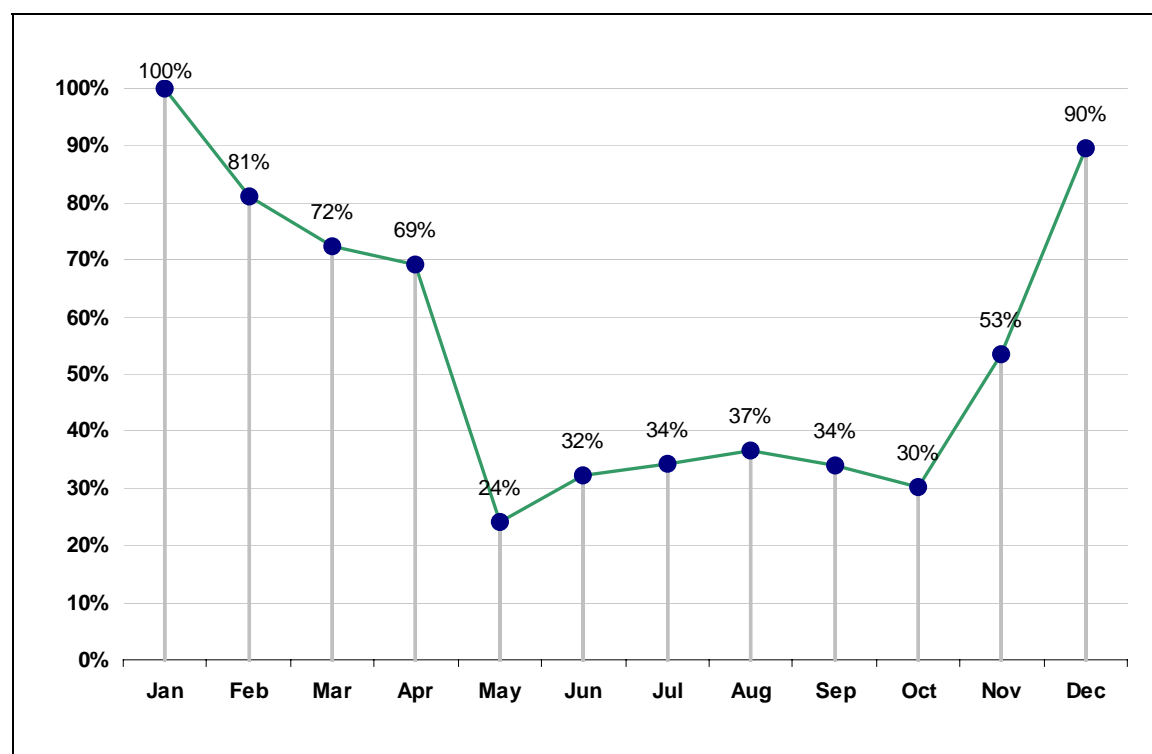


Figure 36: Monthly Requirements of Jet (2004)

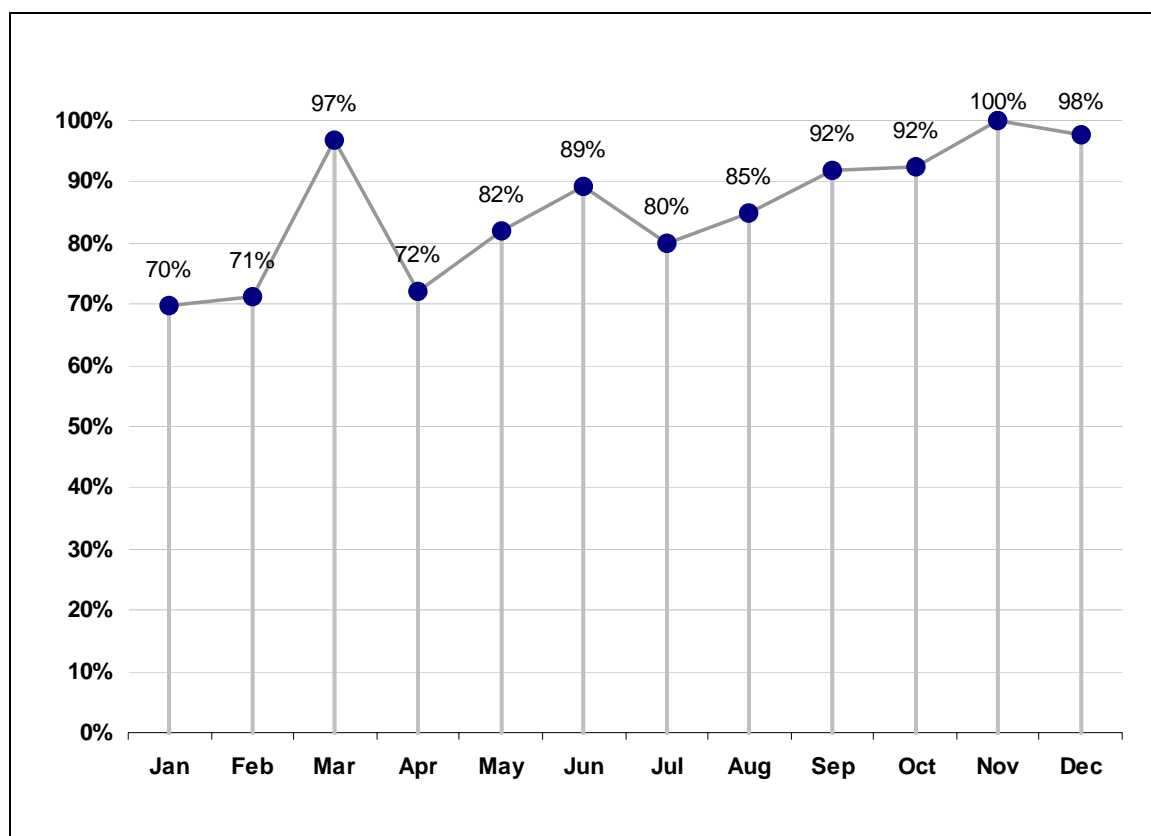


Figure 37: Monthly Requirements of Gasoline (2004)

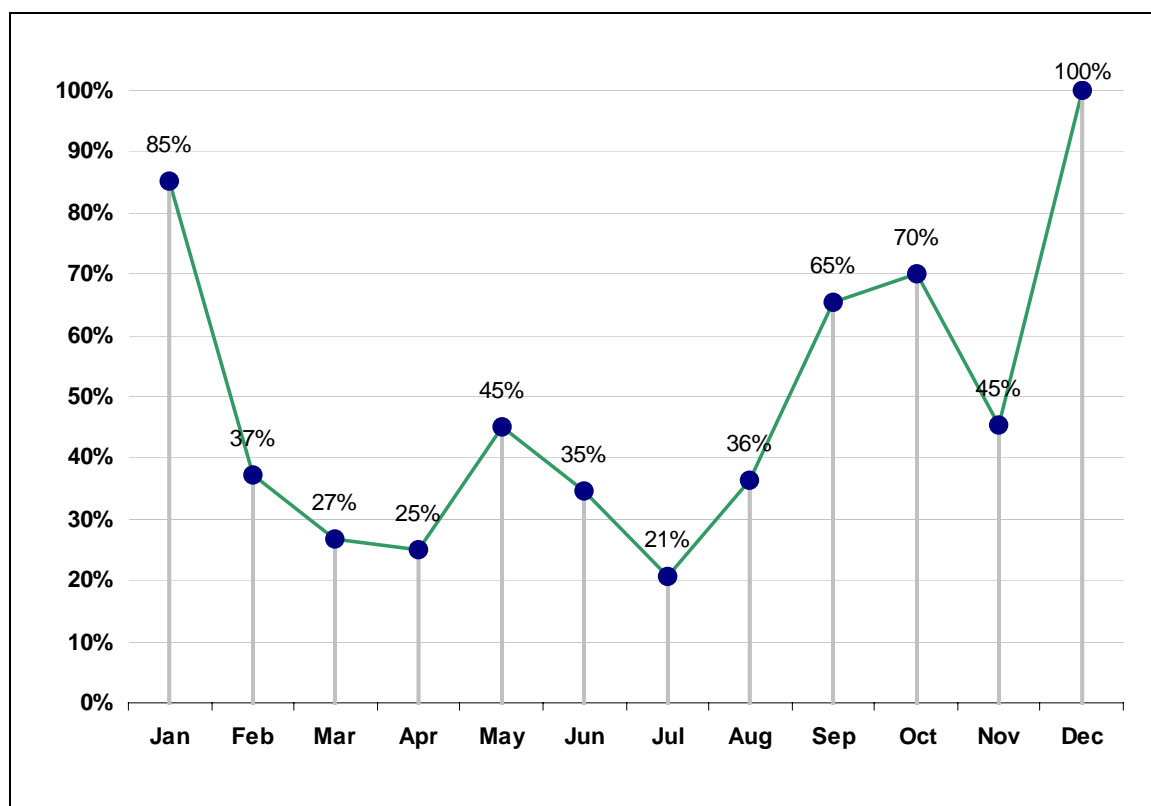


Figure 38: Monthly Requirements of Kerosene (2004)

6 THE ELECTRICITY CONSUMPTION

The significance of transformation from primary sources (mainly HFO and diesel, and a small proportion of solar radiation) was already described in previous sections. Within this chapter, a more detailed explanation of the situation in the electricity sector will be provided. With regard to the Terms of Reference, the description exclusively deals with the service area of NAWEC, and the consumption characteristics of its grid-connected customers. The description follows the general power supply chain, from power generation over power transmission / distribution to the final end use.

6.1 TRANSFORMATION FROM PRIMARY TO SECONDARY ENERGY

In the Greater Banjul Area (GBA), electricity is produced at the Kotu power station by diesel-run generators with a total installed capacity of 46 MW. Table 12 shows the parameters for each unit of the Kotu power station. Commissioning years are between 1981 and 2001. Unit Banjul IC G11 is currently out of operation. The total available capacity amounts to 30.5 MW at present.

Over the period 1995 up to 2004, installed capacity grew from nearly 14 MW to 46 MW. Beside the construction of new units, the retirement of the Yandum 1 and Yandum 2 unit has influenced the development within the nineties. Both units with an installed capacity of 0.75 MW each, were shut down in 1997/1998. Figure 39 present the development of capacity figures in the past. The increase in available generation capacity is corresponding to the consumption of primary energy sources HFO and diesel (compare with section 5.2.1 and 5.2.2).

Table 12: Installed and Available Capacity in the Greater Banjul Area (2004)

Unit	Capacity		Status	Commissioning Year [a]
	Installed [MW]	Available [MW]		
Total	46.0	30.5		
BANJUL IC G01	3.0	2.0	OPR	1981
BANJUL IC G02	3.0	2.0	OPR	1981
BANJUL IC G03	3.4	2.5	OPR	1997
BANJUL IC G04R	6.4	6.0	OPR	2001
BANJUL IC G06	6.4	6.0	OPR	1990
BANJUL IC G07	6.4	6.0	OPR	2001
BANJUL IC G08	6.4	6.0	OPR	2001
BANJUL IC G11	11.0	0.0	STN	1997

Source: NAWEC 2005

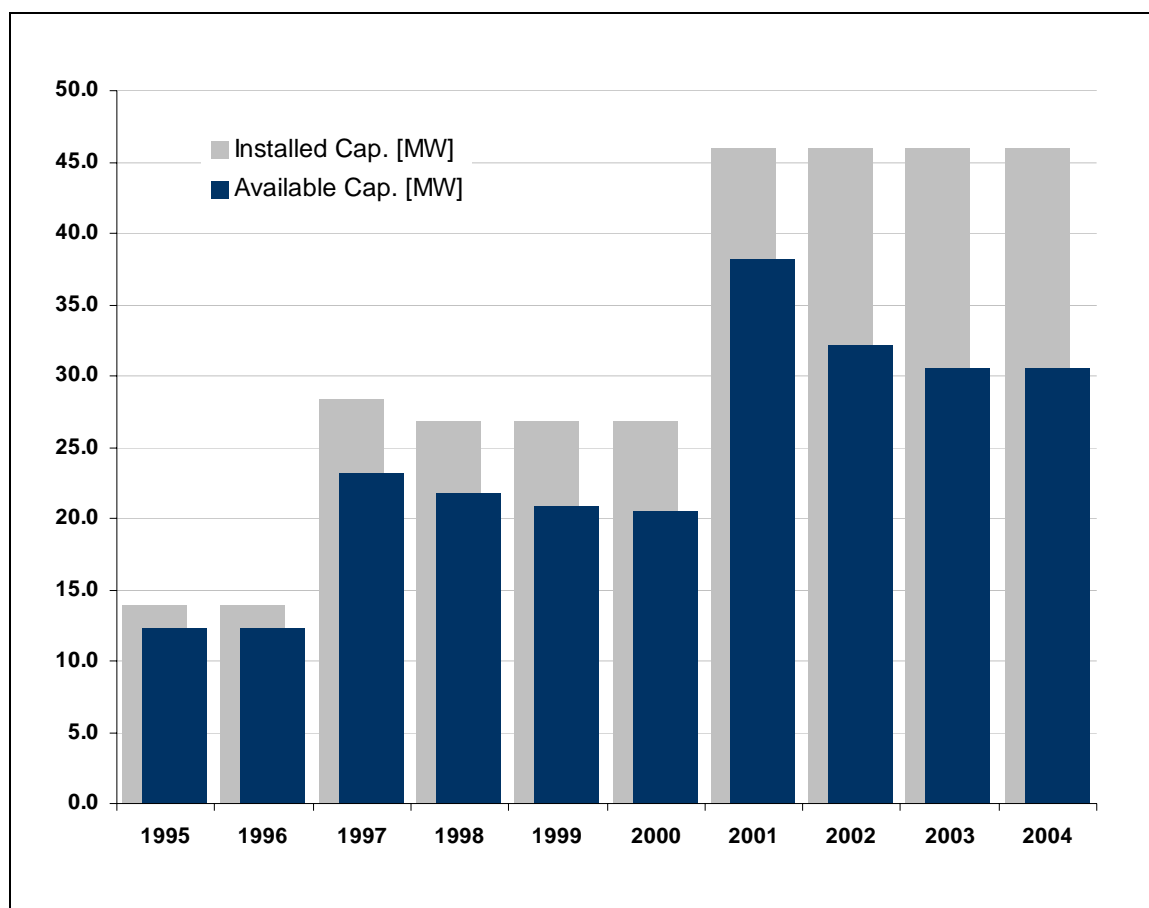


Figure 39: Development of Installed and Available Capacity (1995-2004)

Six isolated power stations; located at Mansakonko (400 kW), Farafenni (400 kW), Kere-
wan (142 kW), Janjangbureh (270 kW), Bansang (420 kW), and Basse (640 kW); supply
electricity to areas of The Gambia outside the GBA (rural areas). All the power stations
are equipped with diesel-run generators, which, when available, supply electricity for 12
to 15 hours per day to the surrounding areas through low voltage lines (400 V three
phase and 230 single phase). In addition, a total of 15 km of 11 kV transmission lines
transfer energy from the power stations at Mansakonko, Farafenni, Bansang and Basse
to 15 remote transformers from where low voltage lines originate to supply other cus-
tomers. A project currently under implementation will increase the installed production
capacity to 4,260 kW. Table 13 below gives an overview of the scheduled installed
capacity of isolated power stations.

Explicitly, despite the imbalance of foreign exchange trading market and the high cost of
electricity production, NAWEC robustly committed to enhancing and expanding the co-
verage electricity services nationwide and aims at increasing the installed capacity to at
least 190 MW by 2020. To achieve this objective, an average rate of capacity increase of
more than 9 % is required.

Table 13: Scheduled Installed Capacity in Isolated Service Areas

Unit	Installed [kW]	Capacity Units [kW]	Fuel Storage [m³]
Total	4,260		
Barra-Essau	460	2x200kW / 1x60kW	60
Kerewan	220	1x100kW / 2x60kW	30
Farafenni	1,400	2x600kW / 1x200kW	180
Kau-ur	180	3x60kW	30
Bansang	600	2x200kW	60
Basse Santa Su	1,400	2x600kW / 1x200kW	180

6.2 TRANSPORT OF ELECTRICITY

Over the years, the actual available generation capacity in the Greater Banjul Area could not be effectively transmitted and distributed due to the poor and archaic transmission and distribution network. Two 33 kV transmission lines with a total length of 25 km convey electricity from Kotu to 33 kV / 11 kV substations. Lines at a voltage of 11 kV (total length 181 km) from the substations carry electricity to 11 kV/ 400 V-substations at various locations in the GBA and Brikama. Low voltage lines from the substations distribute electricity to three phase and single-phase consumers at 400 V and 230 V respectively.

The existing Transmission and Distribution System is characterised by acute problems that have become more distinct since the addition of 18 MW in the Kotu power station in the year 2001. Constraint exists in the medium-voltage network in adequately offloading



Figure 40: Electricity supply by NAWEC

the existing power to the grid. This problem is aggravated by the fact that the majority of the medium voltage feeders are not only overloaded but do contain sub-standard sections which restrict their transmission capacity. The most adverse consequence of these problems is that load shedding is inevitable even when there is sufficient generating capacity at Kotu Power Station. Further, the system was such that any fault of the Transmission / Distribution lines could cause a total collapse of the power network.

In light of this, and in view of NAWEC's commitment to the provision of nationwide electricity supply, the company embarked on a comprehensive and effective rehabilitation, expansion and enhancement of the transmission and distribution networks, known as the "Greater Banjul Area – Transmission and Distribution Network Project". The results of this project are anticipated to effectuate a significant reduction in technical electricity losses and increase system reliability. Table 14 shows the development of losses over the period 1995 to 2004. The compilation includes the annual gross and net generation, as well as the final / billed electricity consumption (including NAWEC's own electricity requirements). The maximum losses occurred in 1997 with a proportion of 40%. It is recognisable, that loss figures varies enormously over the period under consideration. For example, the billed consumption in the year 2003 was 6% less than it was by 2001. On the other side, the annual net generation was 3% higher in 2003 compared with 2001. The overall losses in 2003 amounted to more than 24% and beside technical losses, a significant proportion of non-technical (commercial) losses is indicated.

Table 14: From Generation to Final Electricity Consumption (1995-2004)

Item / Years	1995	1996	1997	1998	1999
Total Generation [MWh/a]	83,874	84,405	109,925	118,791	128,658
Station Use [MWh/a]	3,916	4,024	3,951	5,740	6,296
Net Generation [MWh/a]	79,958	80,381	105,974	113,051	122,362
Billed Consumption[MWh/a]	56,830	48,691	62,003	74,750	92,382
Total Losses [MWh/a]	23,128	31,690	43,971	38,301	29,980
Total Losses [%]	27.6%	37.5%	40.0%	32.2%	23.3%

Item / Years	2000	2001	2002	2003	2004
Total Generation [MWh/a]	116,907	146,859	163,062	150,307	128,061
Station Use [MWh/a]	6,043	6,302	2,697	5,958	2,644
Net Generation [MWh/a]	110,864	140,557	160,365	144,349	125,417
Billed Consumption[MWh/a]	90,714	114,615	128,347	107,718	93,334
Total Losses [MWh/a]	20,150	25,942	32,018	36,631	32,083
Total Losses [%]	17.2%	17.7%	19.6%	24.4%	25.1%

6.3 FINAL CONSUMPTION OF ELECTRICITY

The Gambia has over the last decades witnessed a rapid population, infrastructural and business expansion, triggering a correspondingly rising demand in the generation and transmission of electricity. Due to the poor state of transmission and distribution networks, the magnitude of the demand has exceedingly outstretched the available installed capacity, thus culminating in the re-occurrence of frequent maintenance intervals and continuous load shedding. Therefore, the historical and present billed electricity demand figures cannot reflect the actual requirements of NAWEC's customers. Peak and annual demand figures, registered by NAWEC extremely depend on capability of the transmission and generation side, and in particular on available capacity and fuel delivery.

Figure 41 provides the development of net-generation and billed consumption in recent years. In 2004 the final consumption amounted to 93,334 MWh/a. NAWEC, currently under the purview of the Office of the President should, ideally, meet the needs of up to 100,000 customers. As provided by the utility's commercial division, at present the total number of electricity customers amounts to only 35,270 (December 2004). No significant change was registered compared with the figures of the preceding year. The total customer number (including water supply) grew by only 3 % from 52,400 (by the end of 2003) to 54,000 (by the end of 2004). The customer base within the provinces with some 2,700 is also low. Beside these clients (mainly from the residential sector) the isolated

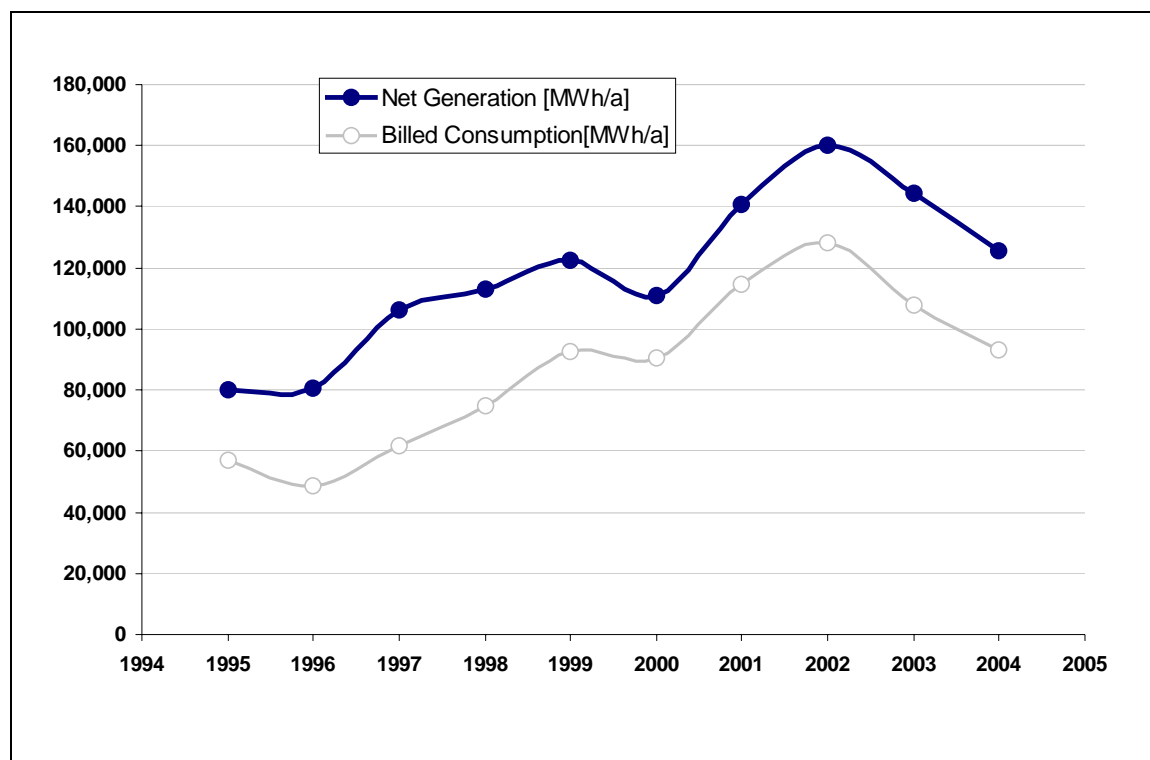


Figure 41: Development of Net Generation and Billed Consumption (1995-2004)

power stations supply the water reticulation systems in Basse, Bansang, Jangjanbureh, Mansakonko, Farafenni and Kerewan.

Based on the population and household figures, discussed in detail in chapter 3 “The Demography of the Gambia”, the present electrification rate can be calculated as follows. Within the Greater Banjul Area (Capital Banjul and Kanifing) the electrification rate represents 50.1%. Countrywide the rate of access to electricity supplied by NAWEC stands at 19.4%.

The annual electricity consumption per customer group is provided in Table 15. By the end of the nineties, the utility launched the pre-payment “Cash Power” programme to reduce non-payment of bills and to address the issue of non-technical losses. The so-called “maximum demand” in NAWEC’s statistics are larger commercial and industrial clients (e.g. supermarkets, hotels and telecommunication companies).

Table 15: Final Consumption by Customer Groups (1995-2004)

Final Consumption [MWh/a] / Year	1995	1996	1997	1998	1999
Domestic	28,278	26,985	29,911	37,463	48,851
Commercial	15,409	11,907	16,551	16,235	16,231
Maximum Demand	6,783	5,077	9,191	11,181	10,820
Agriculture	1	2	1	7	13
Local Authority	291	389	441	462	504
Central Government	6,068	4,331	5,908	6,282	6,982
Prepayment Domestic					
Prepayment Commercial					
Prepayment Maximum Demand					
Own Use				3,120	8,981
TOTAL	56,830	48,691	62,003	74,750	92,382

Final Consumption [MWh/a] / Year	2000	2001	2002	2003	2004
Domestic	45,676	55,118	61,887	48,684	38,833
Commercial	14,362	16,902	15,957	9,013	7,771
Maximum Demand	9,467	12,859	17,237	25,122	26,151
Agriculture	39	58	64	6	4
Local Authority	841	740	507	389	279
Central Government	7,168	8,796	8,974	7,076	7,195
Prepayment Domestic	1,030	4,028	6,119	6,403	4,864
Prepayment Commercial	1,046	3,448	4,336	2,929	1,983
Prepayment Maximum Demand	1,046	3,448	4,336	1,202	780
Own Use	10,039	9,218	8,930	6,894	5,474
TOTAL	90,714	114,615	128,347	107,718	93,334

Source: Commercial Division – NAWEC 2005

6.3.1 Sector Break Down

Nearly half of the annual electricity consumption in NAWEC's service area is caused by the Gambia's residential sector (see Figure 42). The group of large (mainly industrial) customers comprises almost a third and the commercial sector contributes some 11% of the billed consumption. The institutional sector (including local authorities and central government) ranks on fourth place with some 8.5%. Almost negligible is the requirement of the agricultural sector. As shown in the previous Table 15, agriculture's consumption dropped from its maximum value of 64 MWh/a in 2002 to only 4 MWh/a in 2004. This decrease is in particular the result of the constantly diminishing agricultural crop land in the Greater Banjul Area. In 2004, the proportion of agricultural consumption amounted only 0.01%.

Based on customer numbers and annual electricity consumption figures the present specific consumption (also called energy intensity) was calculated. Approximately 2,500 kWh is consumed as an average by each customer per year. The group of large (mainly industrial) customers represent the highest intensity with more than 26,900 kWh/(a,C), followed by the institutional sector with nearly 7,500 kWh/(a,C), and the institutional sector with some 4,700 kWh/(a,C). While intensity within the agricultural sector is less than 500 kWh/(a,C), one household client consumes an average of 1,490 kWh/a. Related to the entire population number, the final electricity consumption is less than 63 kWh per capita and year. The Gambia belongs to those countries with the lowest per-capita-electricity consumption. Annex 8 provides an Africa-wide comparison concerning this matter.

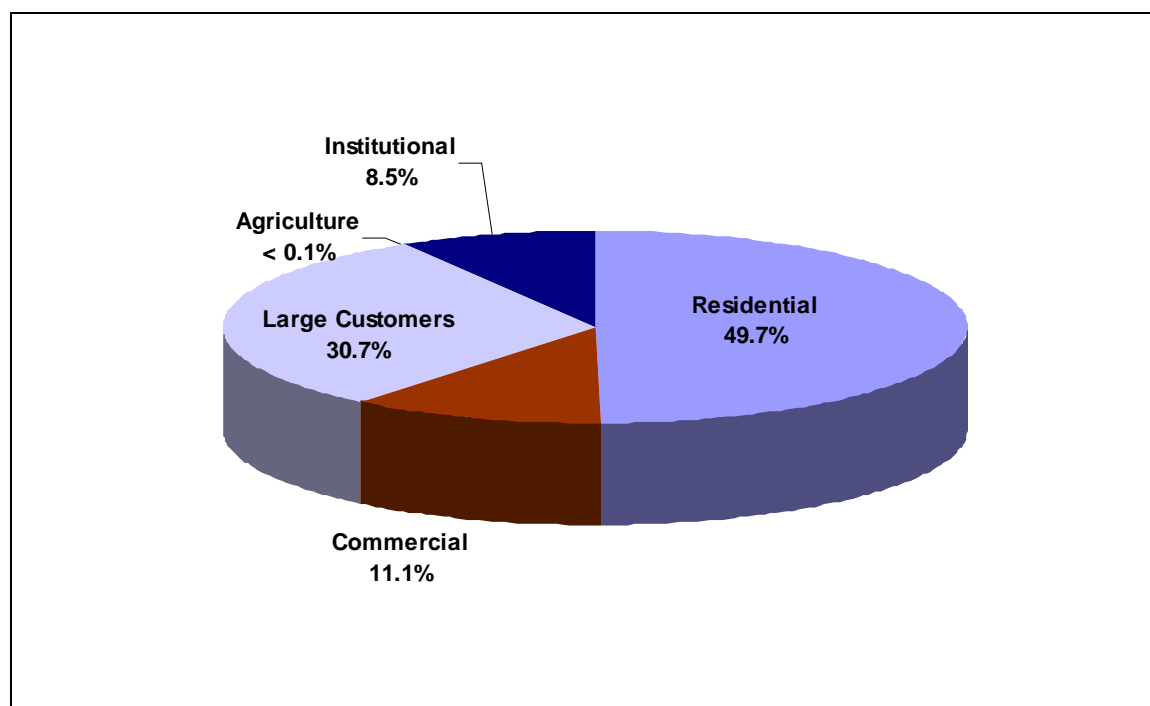


Figure 42: Sector Break Down of Electricity Consumption (2004)

6.3.2 Seasonal Characteristics and Suppressed Demand

As already mentioned, the actual available generating capacity defines / limits the peak and overall consumption of NAWEC customers. The following figure shows the consumption pattern for each customer group over the year 2004. Due to its very low consumption, the agricultural sector is not illustrated separately. Monthly electricity consumption in this sector varies between only 200 kWh/mon and 500 kWh/mon.

As stated by NAWEC currently some 10 MW is load-shed on an average basis. In 2004, the available capacity amounted to 30.5 MW. There is also around 45 MW of private generation capacity associated in particular with hotels and industry. The peak demand which was recorded in December 2004 amounted to 25.2 MW (see Table 16). Taking into account the suppressed demand due to load-shedding, self-generation and transport capacity constraints, a revised maximum power demand as at today is close to 60 MW.

Table 16: Comparison of Recorded Peak Load and Available Capacity

Capacity	2000	2001	2002	2003	2004
Peak Load [MW]	20.1	25.2	27.3	25.9	25.2
Date recorded	20-Jan	19-Nov	25-Feb	12-Dec	23-Dec
Available Cap. [MW]	20.5	38.2	32.2	30.5	30.5

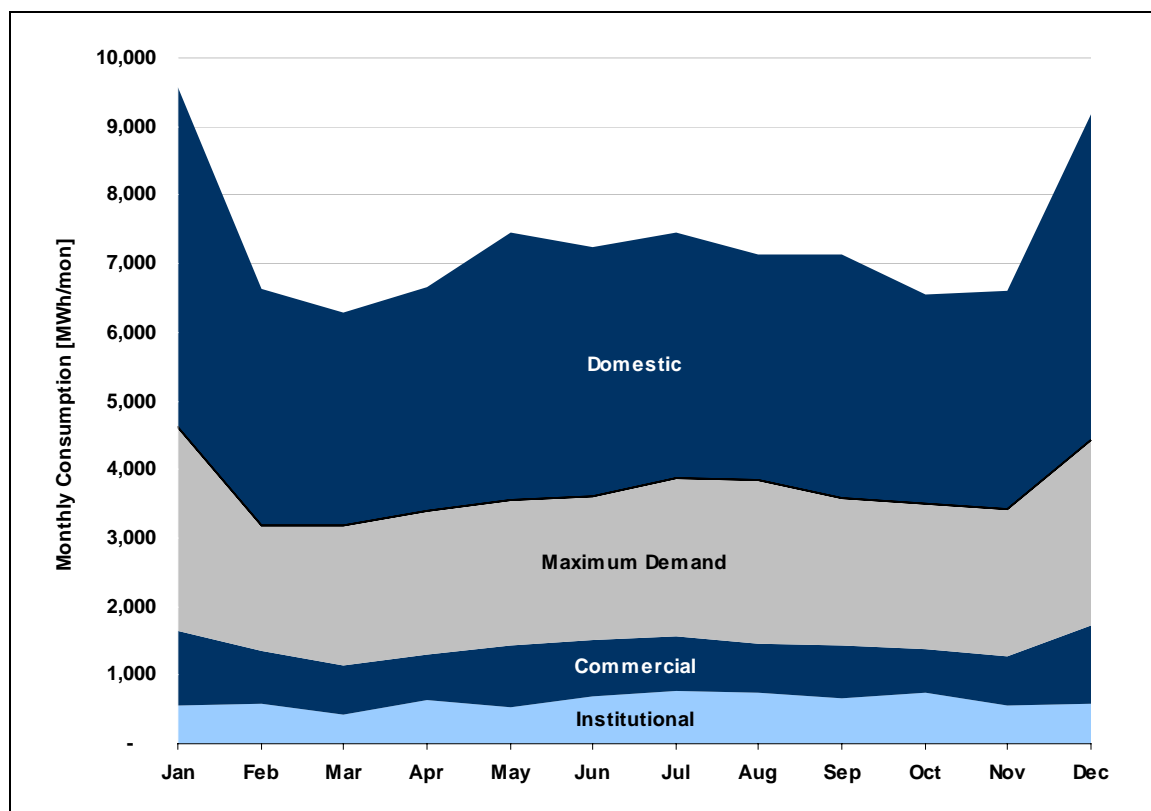


Figure 43: Monthly Electricity Consumption Characteristics per Sector (2004)

The entire annual electricity demand at power plants' sent-out level is estimated by NAWEC at 289 GWh/a in 2004. This figure the actual served demand plus the suppressed demand over the period of one year. The comparison of this figure with the actual net generation of some 125 GWh/a (see Table 14) shows, that more than the double of NAWEC's plants' output is needed, to address the electricity demand (including technical and non-technical losses) within the service area.

The residential sector is that sector, which is mostly affected by load-shedding. As usual, some of the other customer groups are supplied with priority. Nearly not affected by load-shedding is the institutional sector. Consumption figures of that sector can represent soonest the actual requirements of this customer group.

While Annex 9 provides an insight into the monthly characteristics of all sectors, the institutional sector pattern is extracted in Figure 44. A comparison of monthly consumption and average temperatures per month was carried out. Due to the use of air-conditioners in the institutional sector, logically the consumption trend⁵ follows mainly the trend of average temperatures over the year. Some divergences were observed, which

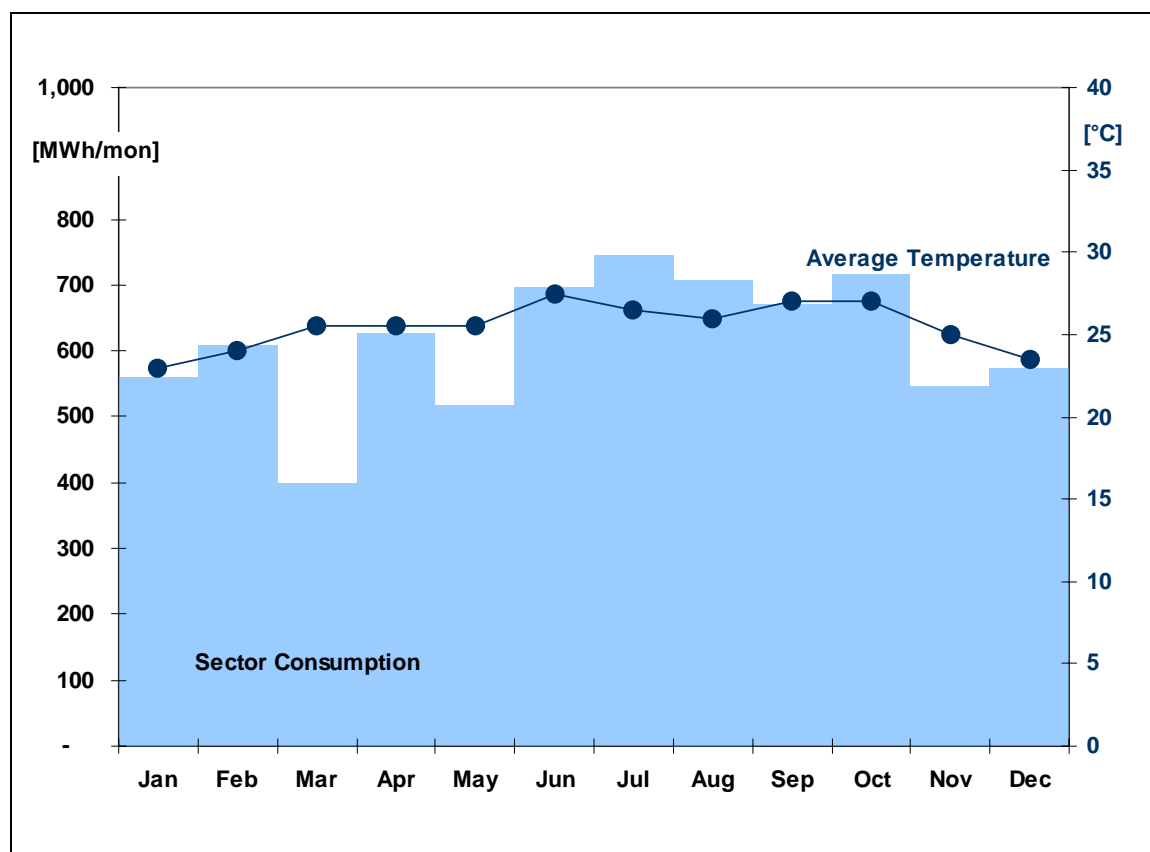


Figure 44: Electricity Consumption of the Institutional Sector and Average Temperature

⁵ Within the graph, monthly consumption figures were adjusted. The different number of days per month was taken into account.

can be caused by digressive temperatures or other impacts on customers' typical consumption behaviour (e.g. Ramadan period). Nevertheless, consolidated findings for only one sector cannot be transferred to other customer groups; and cannot provide a sound standing picture of daily / monthly or seasonal characteristics of the entire demand side. The dimension of load shedding in the Gambia's electricity sector does not allow any well-founded description of customers consumption characteristics over selected time periods. Concerning this matter some general traits of major customer groups and their impact to demand characteristics will be discussed in the following.

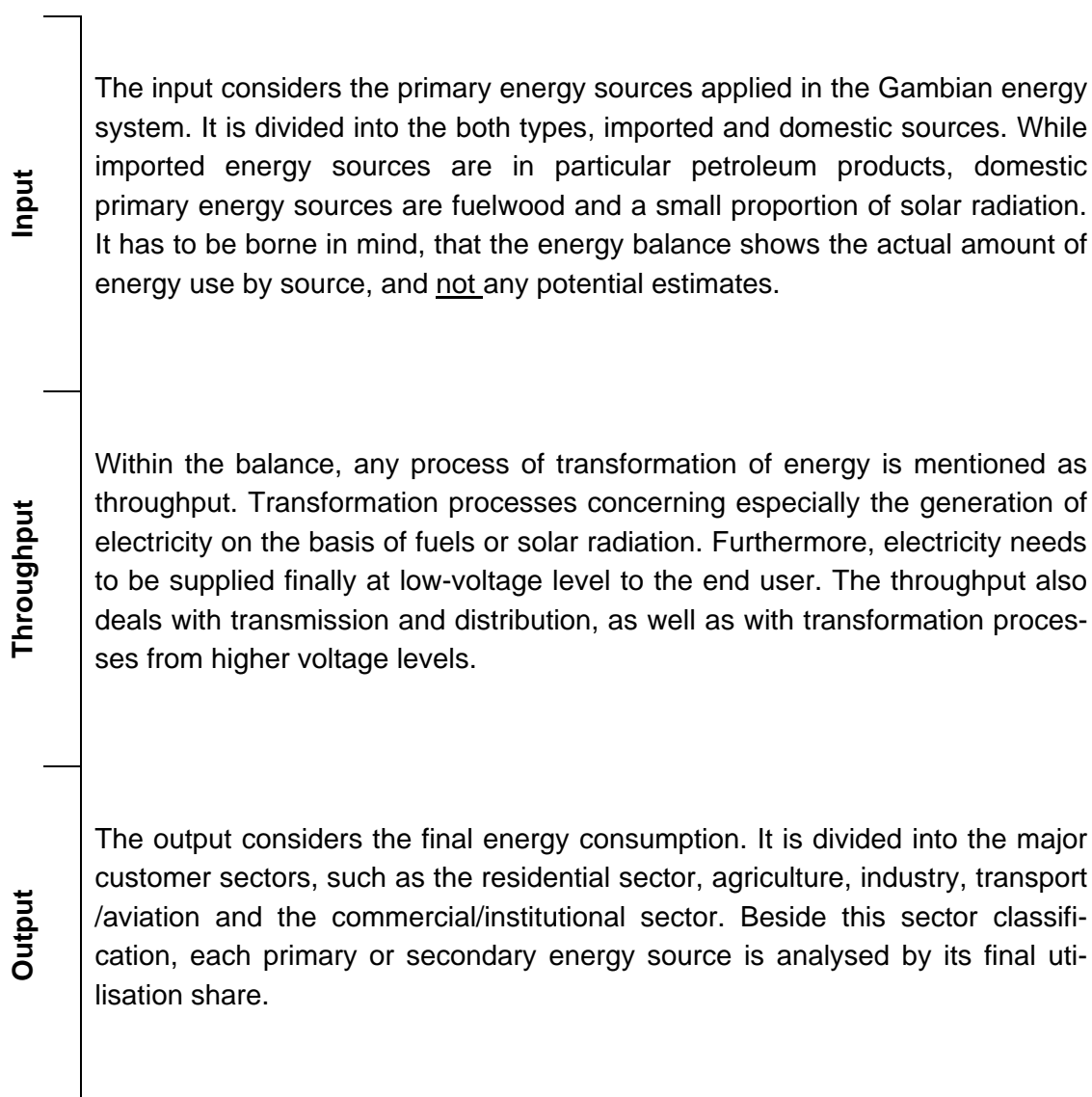
The **residential sector** is defined as private household establishments that consume energy primarily for air conditioning, lighting, refrigeration, water heating, cooking, and telecommunication. Type and number of electrical devices applied in private households depend on customer's financial position, customer's habits as well as climatic conditions. Power demand of the residential sector is characterised by most constant annual growth rates and can possess highest seasonal fluctuations (e.g. due to climatic conditions, number of daylight hours). In many cases, the load of the residential sector is responsible for significant seasonal variation in system's total peak and monthly energy demand.

The **commercial sector** is generally defined as non-manufacturing business establishments, including wholesale businesses and retail stores. During working days, the commercial sector can cause seasonal fluctuations in particular due to the use of air conditioning. The sectors contribution to system's peak demand during evening hours is low (due to opening hours of commercial establishments). The consumption characteristics of customers within the **institutional sector** is similar. This sector comprises governmental institutions, local authorities, educational establishments, but also hospitals and health centres.

The **industrial sector** is generally defined as manufacturing, construction and mining, establishments. In several cases, the industrial sector includes also agriculture, fishing or forestry. It was observed by the Consultant, that several statistics in the Gambia (e.g. NAWEC's billing statistics) allocated the tourism branch (e.g. hotels, motels, restaurants) to the industrial sector. This fact should be mentioned in terms of sector-specific statements. The electricity demand of the industrial sector is considered primary as base load that contains little weather dependent variation.

7 THE ENERGY BALANCE OF THE GAMBIA

This section summarises the results within the frame of the assessment of the utilisation of primary and secondary energy sources in the Gambia. The energy balance comprises the entire supply chain, beginning from domestic and imported energy sources, over transformation and transport processes to the final consumption by source and sector. The balance is presented in form of a Sankey diagram (energy-flow-diagram) which is presented in Figure 45, and considers the following items:



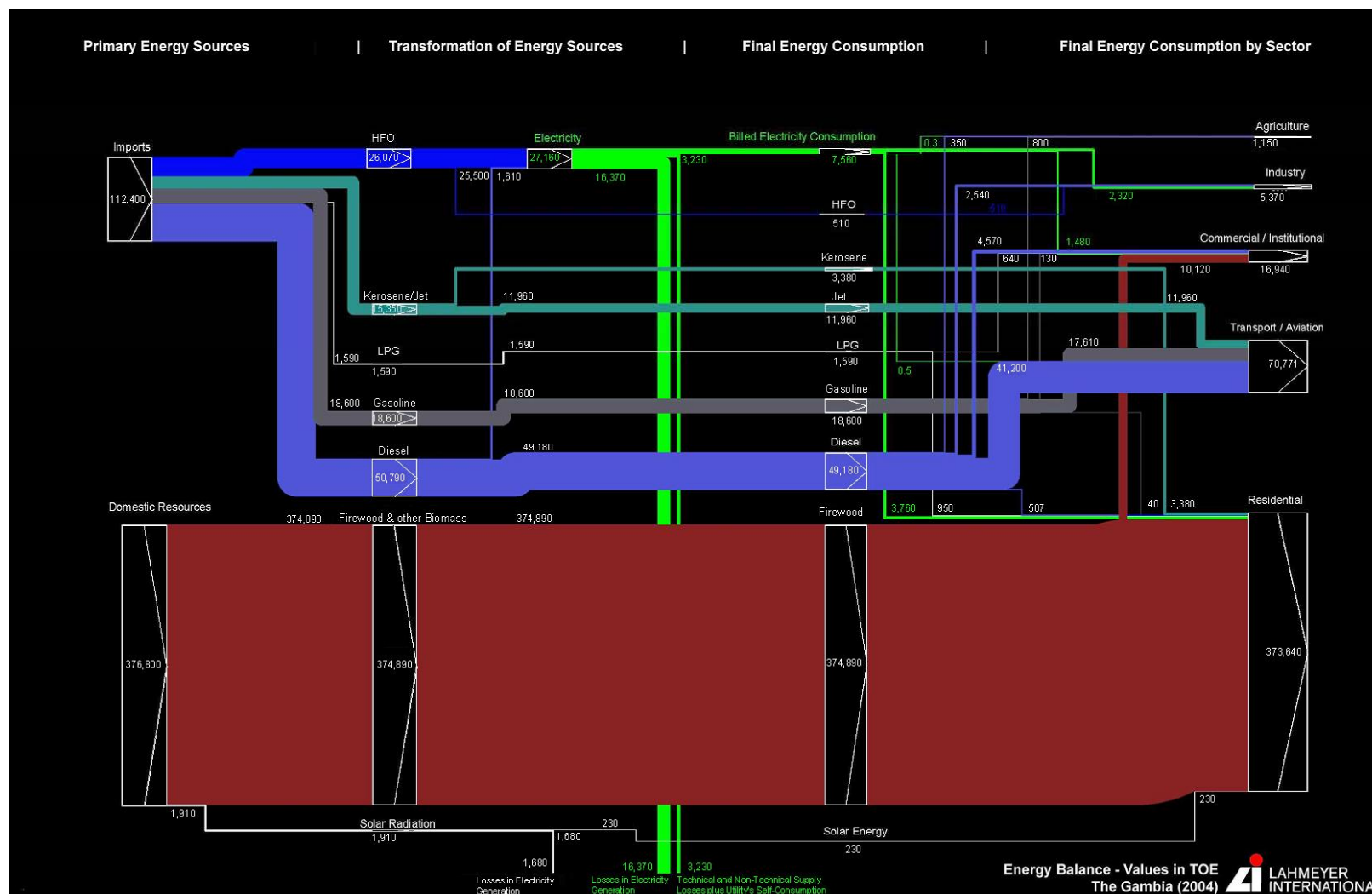


Figure 45: Energy Balance in TOE/a (2004)

8 PROJECTION OF PRIMARY AND SECONDARY ENERGY

The energy demand forecast is an essential prerequisite for planning activities, in particular for energy supply system expansions and the substitution of one energy source by another. If projected demand levels are too low, serious adverse economic consequences for consumers and the economy at large could occur. If projected demand levels are too high, excess resources can impose undue financial hardships on suppliers and their consumers. In addition, this situation results in unnecessary and high economic opportunity costs associated with resource misallocation.

As described in the previous chapter, analyses of nation-wide energy consumption need to consider transformation processes, different purposes in terms of the final energy use, as well as characteristics of individual customer groups. Trends in energy consumption over the past ten to fifteen years were evaluated, the main determinants such as population growth, living conditions and (macro-)economic developments were analysed in detail. The following sections provide the projection of future energy requirements in the Gambia. First, an insight into the methodology and assumptions applied is provided.

8.1 FORECAST APPROACH

There exist two main approaches in terms of forecasting the future electricity demand: the Bottom-Up approach, and the Top-Down approach. In general, the **Bottom-Up** approach considers the country's major customer groups, such as the residential, commercial/institutional and industrial sector. The approach is mainly based on field investigations and surveys. Data and information were gathered from:

- Interviews / inspections of individual customers,
- Assessments of typical, representative customers of several consumer groups (e.g. poor, standard and rich household customers),
- Information from associations of branches,
- Statistics of utility's / suppliers and governmental institutions,
- Discussions with decision makers.

The Bottom-Up approach considers specific characteristics and developments of individual customer groups and can be applied for very detailed forecast studies, which provide projections including sectoral, but also regional classifications. Beside this advantage compared to the Top-Down approach, it can contribute strongly to the improvement of the utility's, supplier's or institution's overall sector knowledge and strategic decision-making process.

Publications of the Gambia's Department of State for Finance and Economic Affairs gives a clear picture of former and expected future (macro-)economic development of the country. Economic Indicators such as the Gross Domestic Product are typical Top-Down

forecast components. Generally, the **Top-Down** approach considers a projection for the major consumer classes (at least residential, commercial and industrial sector) to arrive at a nation-wide forecast level. The proceeding is based on the assessment of economic and energy related data such as:

- The Gross Domestic Product (GDP), historical values, current value and future development,
- The GDP proportion of selected sectors (mainly the industrial sector),
- Energy related indicators (e.g. electricity intensity = electricity consumption / GDP by branch or sector).

Furthermore, demographic data (population number, historical and future growth rate) needs to be evaluated, general previous trends of energy consumption identified and political preferences and objectives considered. The advantage compared to the Bottom-Up approach is the lower number of input data and input assumptions, and in relation to that, the lower effort for data gathering, calculation and forecast modelling. On the other side, the main disadvantages are the limited applicability and the dependence on other forecasts, such as projections in terms of country's economic and demographic development. Usually the Top-Down approach is only applicable for nation-wide forecasts without any regional diversification. Developments for main customer sectors can be projected, more detailed and specific prognosis can hardly be established.

To provide most realistic results within this study, the methodology applied is based on a mix between both approaches. It includes a strong analytical component, but also takes into account selected (macro-)economic indicators, which is possible due to the stable and growing economy of the Republic of the Gambia. The assessment and projection results in this study provide the base for the investigation of possible alternatives to the current energy consumption structure, in order to achieve economic gains in terms of poverty reduction, sustainable development and efficient allocation.

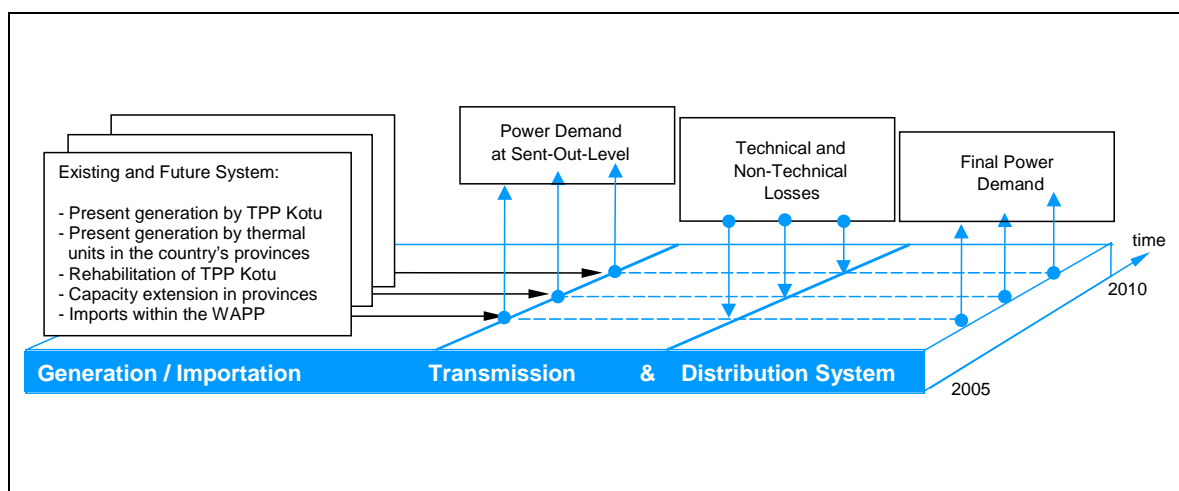


Figure 46: Supply Chain – From Electricity Sent-Out to Final Demand

The history and the present situation show that many significant regional differences in energy consumption characteristics exist in the Gambia. Household sizes, as well as energy types and consumption figures per household differ strongly within the frame of comparison from province to province and from urban and rural areas. Currently the institutional, commercial, industrial and transport sector is concentrated around Banjul. To provide a comprehensive data base, the Consultant has decided to establish a regional break down of future requirements of energy sources. This approach exceeds the given tasks of the Terms of Reference, but is estimated as an essential additional input information for the later identification of renewable energy supply options. The following regions / LGA are considered within the several energy forecasts:

- Greater Banjul Area,
- LGA of Brikama,
- LGA of Mansakonko,
- LGA of Kerewan,
- LGA of Kuntaur,
- LGA of Georgetown,
- LGA of Basse.

A particular significance has the forecast of the Gambia's electricity demand. As shown in the Energy Balance in Chapter 7, the generation of electricity is the major transformation process from primary to secondary energy sources. This means that any increase of conventional primary energy based power generation will have a direct impact to the annual consumption of petroleum products, such as heavy fuel oil and diesel. On the other hand, an increase of power generation would decrease the high proportion of suppressed electricity demand and therefore the use of primary energy sources for self-generation (in particular diesel). Furthermore, a higher electricity access rate will lead to the situation, that currently used energy sources (e.g. for lighting) will lose their significance in the future due to their substitution with electricity.

Not only the present and expected future suppressed demand is considered within the electricity demand forecast. In addition, the consultant has reproduced the entire power supply chain beginning from generation, over transportation (transmission and distribution), and ending at the final (billed) consumption. Figure 46 displays the main parts considered within the entire supply chain. Major future projects at the supply side (short- and middle term until 2010/2011) are:

- The increase of available capacity in the existing generation system of GBA, in particular due to the rehabilitation of Kotu TPP's units, and in particular the start of operation of unit G11 with an installed capacity of 11 MW (compare to section 6.1 "Transformation from Primary to Secondary Energy", Table 12).

- The start of operation of the heavy fuel oil fired Brikama IPP station with an implementation period of 2005 / 2007 and a total installed capacity of 30 MW,
- The increase of available capacity in isolated service areas, in particular due to the construction of several diesel fired units with capacities between 60 kW, and 600 kW (compare to section 6.1 "Transformation from Primary to Secondary Energy", Table 13),
- The active participation in electricity trade as member of the West Africa Power Pool (The following Table 17 illustrates actual estimates for the future electricity import of the Gambia).

Beside the rehabilitation and extension of the existing transmission and distribution grid, the national utility has to undertake suitable measures to reduce the present high losses level, caused by technical, but also non-technical (commercial) losses. Within the forecast a step-wise reduction from currently more than 25% to 10% is considered.

In the following paragraphs, the main assumptions and input data for the forecasts will be explained. The first fundamental forecast component is the projection of the demographic development. Population, household sized and numbers were evaluated separately for each region to arrive at nation-wide level by cumulating the individual regional results. The

Table 17: Expected Electricity Trade of the Gambia (2005-2014)

Period	Imports	Exports
2005-2006	0	0
2007-2008	0	0
2009-2010	235 GWh/a (Senegal)	0
2011-2012	269 GWh/a (Senegal)	0
2013-2014	303 GWh/a (Senegal)	0

Source: West Africa Regional Transmission Project, 2004

input data for the projection of demographic development is mainly based on historical trends within the inter-census periods. It includes:

- The annual change rate of population number in each region,
- A diversification in population numbers in rural and urban areas, which allows a projection of future urbanisation tendencies,
- The nation-wide average household size,
- The change rates of household sizes,
- The derivation of urban (and related to this, rural) household sizes of the several regions from nation-wide average.

The results of this forecast component are in many cases important input data for other projections in terms of the future requirements of energy sources. The entire projection is described in Annex D.0. Other input data than population numbers, to forecast the several primary energy sources are:

- The annual growth rate of the gross domestic product in general,
- The annual growth rate of the gross domestic product of the regarding sectors,
- The break down of energy demand by sector,
- The correlation between annual changes of the gross domestic product and the related annual change of energy applied within the individual sectors,
- General energy intensity (specific consumption) figures, and in selected cases an indexation of intensity over the period under consideration.

In general, the forecasts consider the twenty-years-period 2005-2025. Except the forecast of demographic development, the base year in all calculations is 2004. Because of its derivation, the national census in 2003, the base year for the population projection is the year 2003.

Basically, the electricity forecast follows the procedures described above. Due to its rather complex structure, separate projections are provided, such as the demand at sent-out level and the final demand at end user level (compare with Figure 46). In order to consider the suppressed electricity demand, an adjusted sector break down was applied, which considers not only the billed electricity consumption, but also the presently unserved electricity demand.

8.2 FORECAST RESULTS

This section describes the results of the demand forecast for the different energy sources until 2025. All detailed figures of the projection are provided in form of tables in Annex D. Beside the expected development of energy demand, it includes also the projection of the demographic development in the Gambia.

8.2.1 Projected Fuelwood Demand

The demand forecast for fuelwood in the Gambia expects a slightly increasing development for the period under consideration, i.e. 2005-2025. However, it can be observed, that the average annual growth rates decline in the course of the period. Whereas the projected annual average growth rates are 3.6% for the period from the base year 2004 until 2010 and 2.0% for 2010-2015, before there is a slight decrease between 0.7% and 0.8% average annual growth for 2016-2025. It should be borne in mind that the projection of fuelwood consumption strongly depends on the demographic development. Fuelwood will keep its dominating role as energy source for cooking purposes over the short- and mid-term period. The decrease in annual growth rates figures (in particular within the long-term period) can be ascribed to the changes in population numbers and respectively in the number of households. Furthermore, the assumed reduction of energy intensity to 85% influences the demand figures especially over the period 2016-2025. Table 18 provides the figures of the forecasted fuelwood demand per region, whereas it is also visualised in Figure 47, which presents a regional break down. Fuelwood is utilised in the residential and in the commercial/institutional sector. The increase in demand is higher in the residential sector during the first decade of the demand forecast period: The projected demand results in an average annual growth rate of 5.2% for the residential sector and 2.9% for the commercial/institutional sector from the base year on until 2015. For the second decade however, the annual average growth is 0.7% for both sectors. A detailed break-down of the fuelwood demand forecast in total, per sector and per region is displayed in Annex D.1.

Table 18: Fuelwood Demand Projection in TOE/a (2004-2025)

Entire Fuelwood Demand		Base >>	2010	2015	2020	2025
Total Annual Demand	TOE/a	367,747	454,356	502,225	519,048	539,326
GBA - GREATER BANJUL AREA	TOE/a	95,989	116,374	126,533	132,010	137,798
LGA OF BRIKAMA	TOE/a	104,494	152,374	185,483	195,374	207,555
LGA OF MANSAKONKO	TOE/a	19,655	21,147	21,149	20,914	20,699
LGA OF KEREWAN	TOE/a	46,854	50,258	50,110	48,549	47,038
LGA OF KUNTAUR	TOE/a	21,549	23,880	24,343	24,140	23,943
LGA OF GEORGETOWN	TOE/a	29,270	34,262	36,890	39,324	42,449
LGA OF BASSE	TOE/a	49,936	56,060	57,718	58,736	59,845

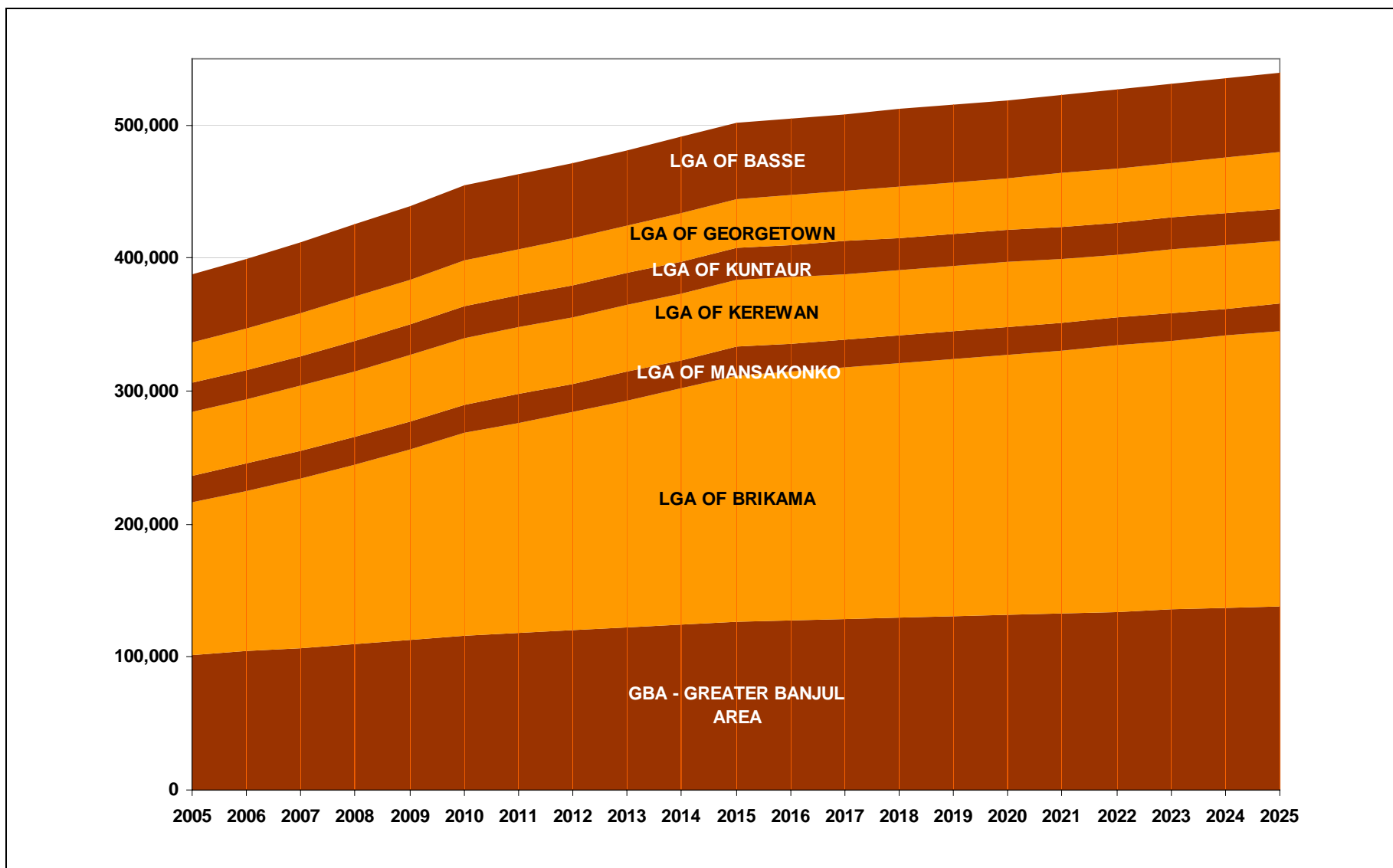


Figure 47: Projected Fuelwood Demand in TOE/a (2005-2025)

8.2.2 Projected Diesel Demand

Apart from a decline in 2010-2011, the overall diesel demand in the Gambia is expected to increase during the considered period 2005-2025, but especially at the end of this period. This arises both from Table 19 and Figure 48. The expected annual average growth rates for the diesel demand are 2.8% for the period from the base year 2004 until 2010, 7.1% for 2010 until 2020 and an average of 7.3% for 2020 until 2025. The sector with the by far highest demand in diesel is the transport sector. The annual average growth rates show an overall increasing tendency with 4.7% from the base year on until 2015 and with 5.8% for 2015-2025. Until 2010, the commercial/institutional sector is expected to contribute with the second highest share to the overall diesel demand in the Gambia.

It should be mentioned, that parts of the future diesel demand are directly related to the future generation / supply of electricity. On the one hand, diesel is an important fuel to produce electricity, on the other hand the amount of diesel which is currently applied for self-generation would be substituted by electricity in total, if it would be available permanently. Due to the expected development of electricity demand / supply, no more significant demand is expected in the commercial/institutional sector from 2011 on, as the electricity demand is fully covered and no additional diesel fired standby-generators are required.

The diesel demand of the Gambian industry is analysed separately for the energy industry and the remaining branches. The diesel demand for the energy industry has to be compared with the Gambian electricity demand as presented in section 8.2.7. The expected average annual demand growth rate from the base year on until 2015 is 11.7%. The projected demand for the second decade is rather minor with an average annual growth of less than 1%.

Table 19: Diesel Demand Projection in TOE/a (2004-2025)

Entire Diesel Demand		Base >>	2010	2015	2020	2025
Total Annual Demand	TOE/a	50,786	60,096	84,756	119,653	170,258
GBA - Greater Banjul Area - Annual Demand	TOE/a	43,137	46,896	63,270	83,815	111,741
LGA OF BRIKAMA - Annual Demand	TOE/a	3,039	5,654	7,644	9,649	12,417
LGA OF MANSAKONKO - Annual Demand	TOE/a	546	578	729	903	1,123
LGA OF KEREWAN - Annual Demand	TOE/a	1,303	1,357	1,697	2,071	2,530
LGA OF KUNTAUR - Annual Demand	TOE/a	583	593	740	938	1,186
LGA OF GEORGETOWN - Annual Demand	TOE/a	803	889	1,182	1,593	2,177
LGA OF BASSE - Annual Demand	TOE/a	1,375	1,488	1,910	2,443	3,135

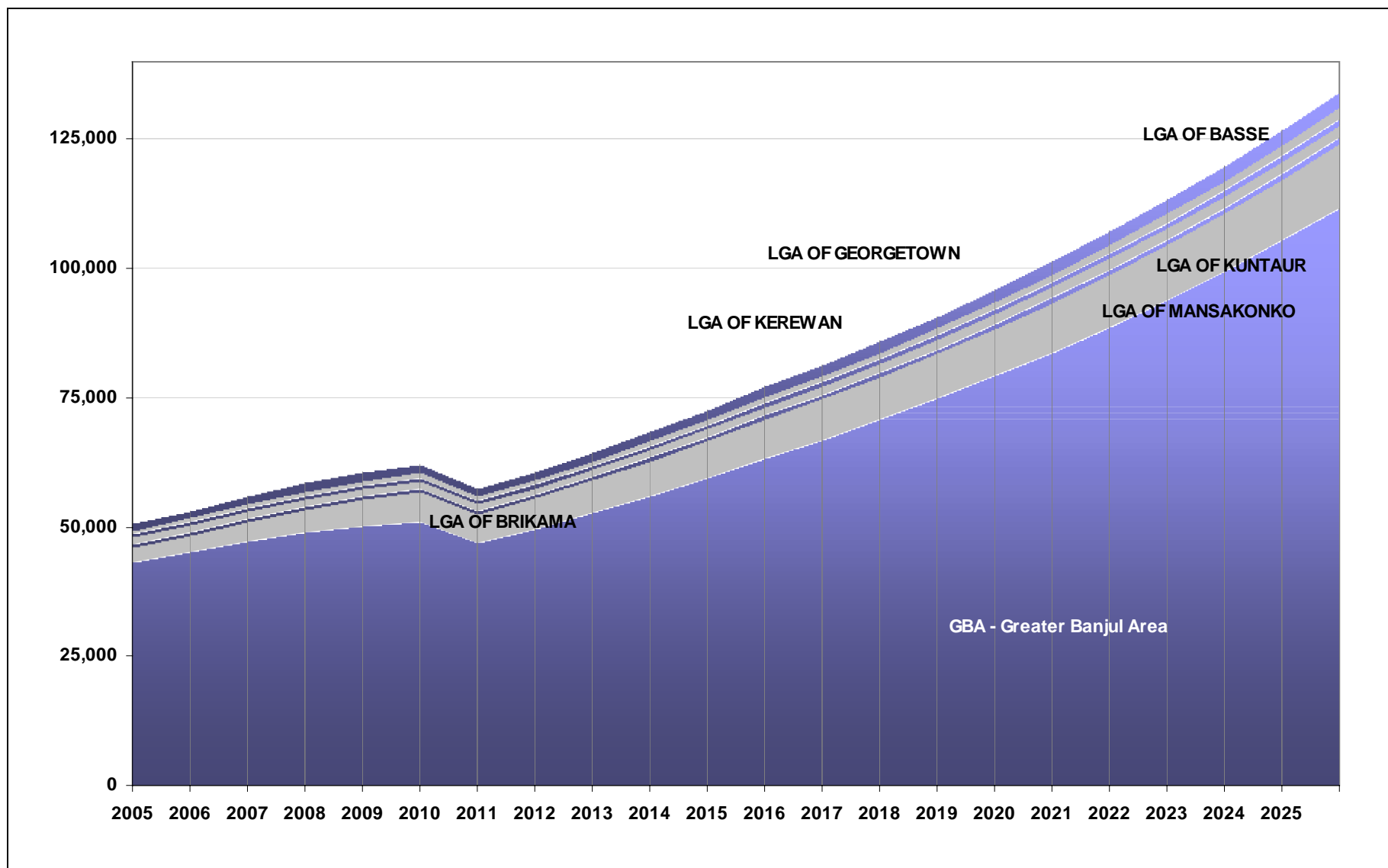


Figure 48: Projected Diesel Demand in TOE/a (2005-2025)

For the remaining branches of the Gambian industry, a rather strong increase in diesel demand is projected for the second decade of the forecast period with an average annual growth demand of 14.4%, after a decrease in demand with a determined change rate of -7.2% per year during the first decade. A comparable pattern in demand is expected for the commercial/institutional sector (average annual growth rate base year-2015: -12.7%; 2015-2025: 7.6%), whereas each the agricultural and the residential sector have rather stable annual growth rates with slightly decreasing values (agricultural: 1st decade: 5.6%, 2nd decade 5.4%; residential: 1st decade: 2.7%, 2nd decade: 2.5%).

Annex D.2 displays in detail all further relevant data of the diesel demand forecast.

8.2.3 Projected Heavy Fuel Oil Demand

In the Gambia, heavy fuel oil is only utilised in the industrial sector. Its demand is thus only analysed on a nation-wide level and exclusively for the industry, but comparable to the industry sector demand for diesel, distinguished in energy industry and remaining industry. The dominating application of heavy fuel oil is the transformation to the secondary energy source electricity, which is concentrated in the Greater Banjul Area.

Figure 49 displays a relatively steep increase in demand from the base year on until 2009, which is followed by a decrease in 2010-2011. Between the long-term period, beginning in 2011 up to the end of the period under consideration, the demand in heavy fuel oil consumption is expected to increase in a slight and more or less stable manner. Splitting the forecast period in half decades, the following average annual growth rates can be determined for the projected HFO demand: 19.7% from the base year 2004 on until 2010, 2.1% from 2010-2015, 0.1% for 2015-2020 and 0.2% in 2020-2025.

An overview concerning the key figures of the demand of this energy source is provided in Table 20, whereas Annex D.3 provides a detailed break-down for the demand during the period under consideration.

Table 20: HFO Demand Projection in TOE/a (2004-2025)

Entire HFO Demand						
		Base >>	2010	2015	2020	2025
Total Annual Demand	TOE/a	26,580	78,305	87,040	87,593	88,366
Total Electricity Demand at Sent-Out Level (including Suppressed Demand)	TOE/a	24,861	51,257	62,278	72,881	87,453
Electricity Demand to be covered by Primary Energy Transformation	TOE/a	10,786	31,047	34,511	34,730	35,036
HFO Demand of Energy Industry	TOE/a	26,070	76,801	85,369	85,911	86,669
HFO Demand of Other Industry	TOE/a	510	1,503	1,671	1,682	1,697

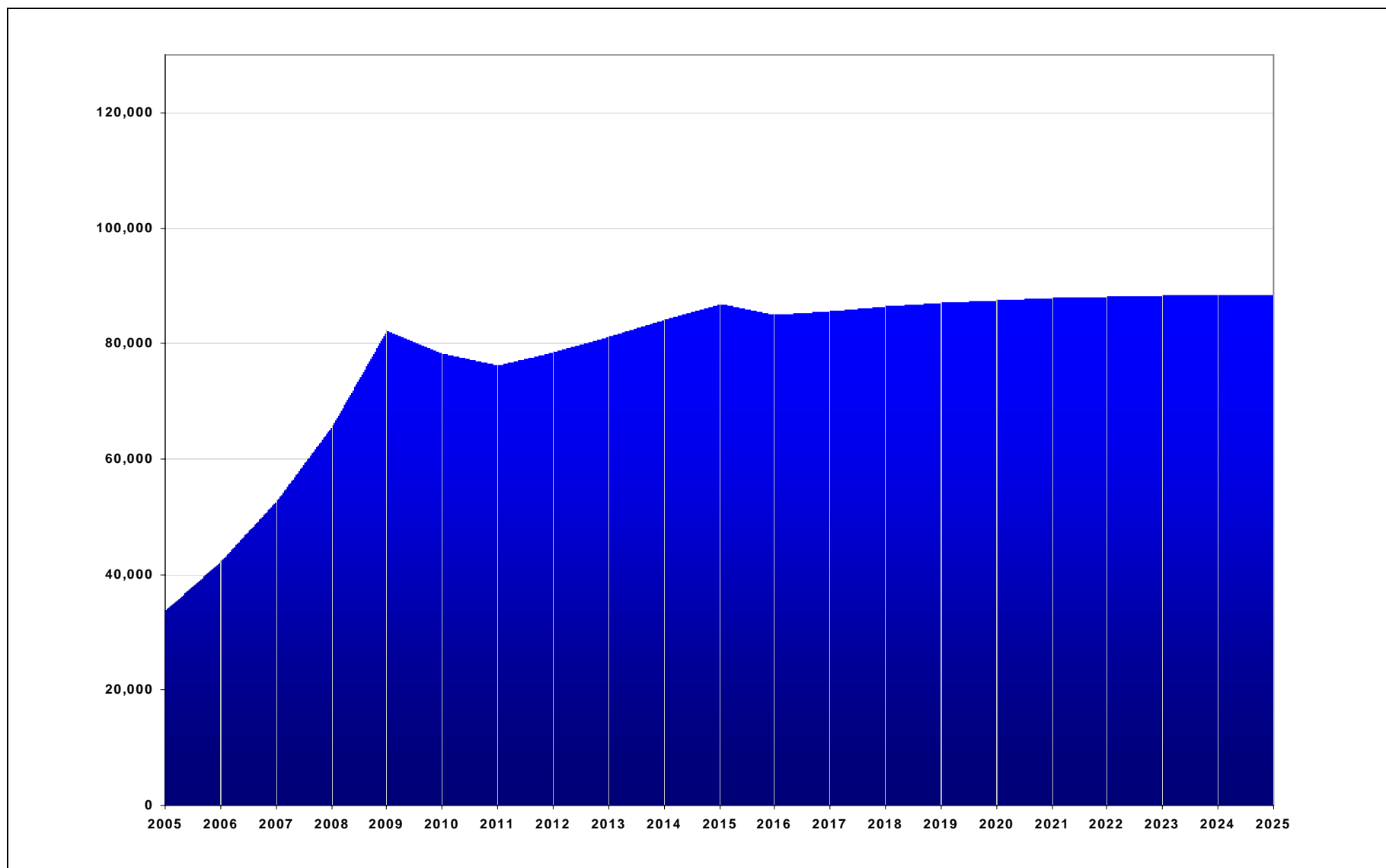


Figure 49: Projected HFO Demand in TOE/a (2005-2025)

8.2.4 Projected Gasoline Demand

A rather stable increase in demand in the Gambia is projected for the gasoline consumption during the period under consideration. The average annual growth rates, which were determined for the gasoline demand, are 4.9% from the base year until 2010, 4.5% for 2010-2015, 3.4% for the last decade.

This development is also displayed in Figure 50 and Table 21 under reference to the different Gambian LGAs. The major sector in gasoline demand is the transport sector. For this sector, also the highest average annual growth rates are expected. These were determined as 4.8% for the first decade of the forecast period and 3.4%. Beside the development of population number, the assumed development of energy intensity is one of the main determinants with the frame of the gasoline demand projection. Concerning this matter, a decrease of energy intensity to nearly three thirds of its present value is expected until the year 2025. For the other sectors utilising gasoline in the Gambia, comparable growth rates are expected. For the first decade, for all of the remaining sectors, i.e. residential, commercial/institutional and agriculture/fishing, average annual growth rates of 2.9% are expected, whereas for the second decade 0.3% are expected for agriculture/fishing and the residential sector. For the same period, with 0.2% a slightly smaller average annual growth rate is projected for the commercial/institutional sector.

Tables with detailed figures of the projected gasoline demand in the Gambia in 2005-2025 are provided in Annex D.4. The annex provides the absolute annual figures, a break down by sector as well as a break down by region. Concerning the regional break down it is shown, that future demand in gasoline will stay concentrated within the Capital Banjul and its periphery.

Table 21: Gasoline Demand Projection in TOE/a (2004-2025)

Entire Gasoline Demand						
		Base >>	2010	2015	2020	2025
Total Annual Demand	TOE/a	17,651	23,557	29,418	34,719	40,978
GBA - GREATER BANJUL AREA	TOE/a	15,004	20,024	25,005	29,511	34,831
LGA OF BRIKAMA	TOE/a	1,029	1,612	2,204	2,659	3,213
LGA OF MANSAKONKO	TOE/a	191	219	246	279	314
LGA OF KEREWAN	TOE/a	456	523	585	648	714
LGA OF KUNTAUR	TOE/a	207	245	281	318	359
LGA OF GEORGETOWN	TOE/a	283	355	429	525	645
LGA OF BASSE	TOE/a	482	579	668	778	902

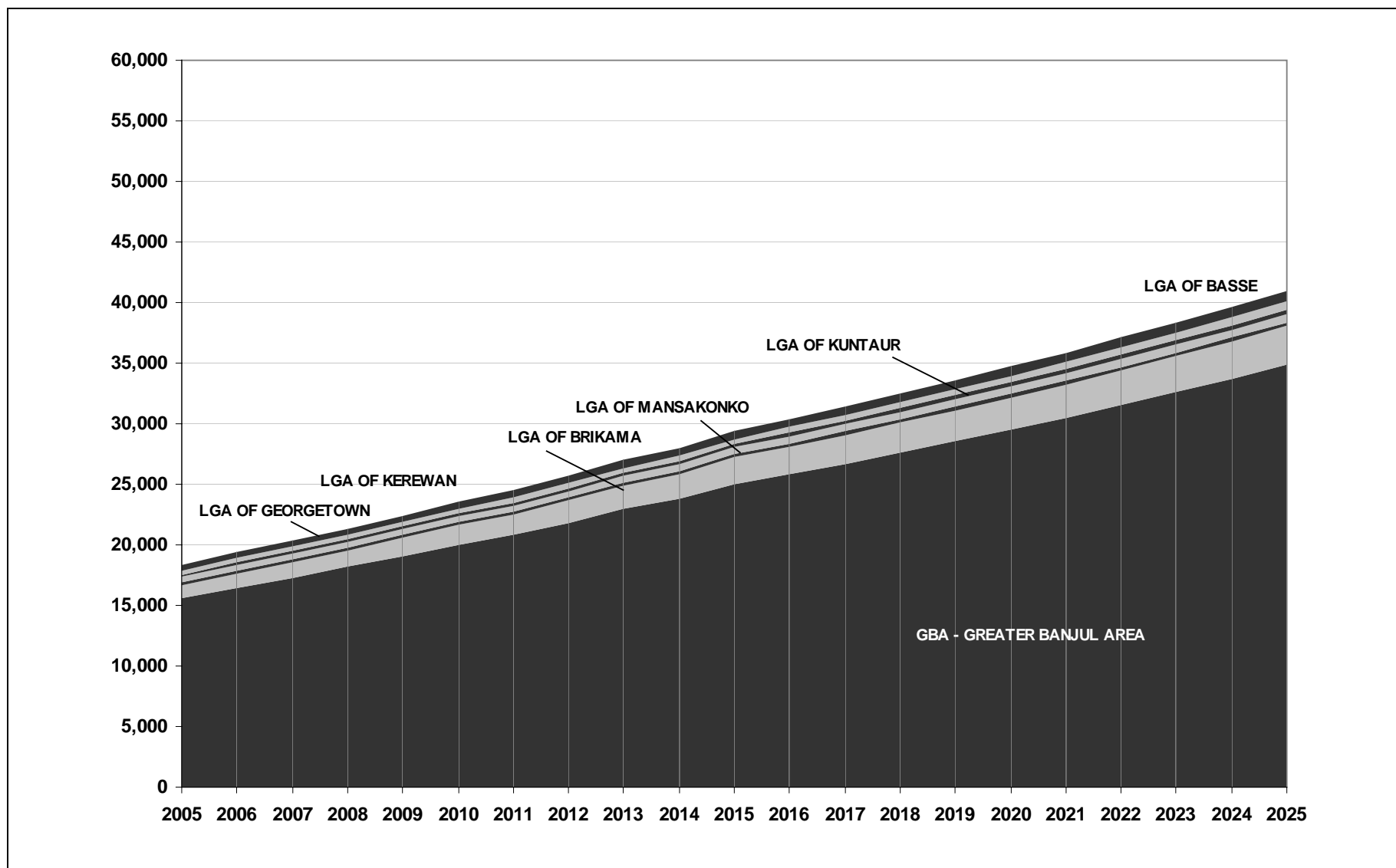


Figure 50: Projected Gasoline Demand in TOE/a (2005-2025)

8.2.5 Projected Kerosene/Jet Demand

Also for the Gambian kerosene and jet demand, an increasing demand development is projected for the years 2005-2025. This can be derived from Table 21. The average annual growth rates constitute 3.1% from the base year until 2010, 3.3% from 2010-2015, approximately 3.1% for the period 2015-2025.

Jet is utilised in the Gambian transport/aviation sector. Kerosene is used in a higher proportion in the residential sector. Within the residential sector, major consumers of kerosene are the inhabitants of rural areas, whereas a shift in proportion is expected during the forecast period. The overbalance of kerosene requirements in rural areas is thus expected to decline, but inhabitants of these regions are still utilising more of this energy source than those in urban areas. Projected annual average growth rates in the residential sector are 2.1% for the first decade of the forecast period 2005-2025 and 1.2% for the second decade. With 4.7% from the base year until 2015 and 5.0% for 2015-2025, a slightly higher average annual growth rate is expected for the Gambia's transport/aviation sector. Due to the different purposes of Kerosene and Jet, the following Figure 51 and Figure 52 present both, the entire demand projection, as well as the separate household based demand of Kerosene only.

More detailed figures demonstrating the development of the Gambian kerosene and jet demand forecast are compiled in Annex D.5. The annex provides indications for the overall, sectoral and regional demand development over the following twenty years.

Table 22: Kerosene and Jet Demand Projection in TOE/a (2004-2025)

Entire LPG Demand						
		Base >>	2010	2015	2020	2025
Total Annual Demand	TOE/a	15,350	18,393	21,605	24,929	29,119
GBA - GREATER BANJUL AREA	TOE/a	6,090	7,883	10,009	12,698	16,122
LGA OF BRIKAMA	TOE/a	3,181	3,833	4,466	4,738	5,105
LGA OF MANSAKONKO	TOE/a	430	458	478	497	518
LGA OF KEREWAN	TOE/a	2,351	2,539	2,677	2,744	2,813
LGA OF KUNTAUR	TOE/a	893	995	1,071	1,124	1,180
LGA OF GEORGETOWN	TOE/a	906	1,023	1,122	1,224	1,348
LGA OF BASSE	TOE/a	1,498	1,661	1,783	1,903	2,034

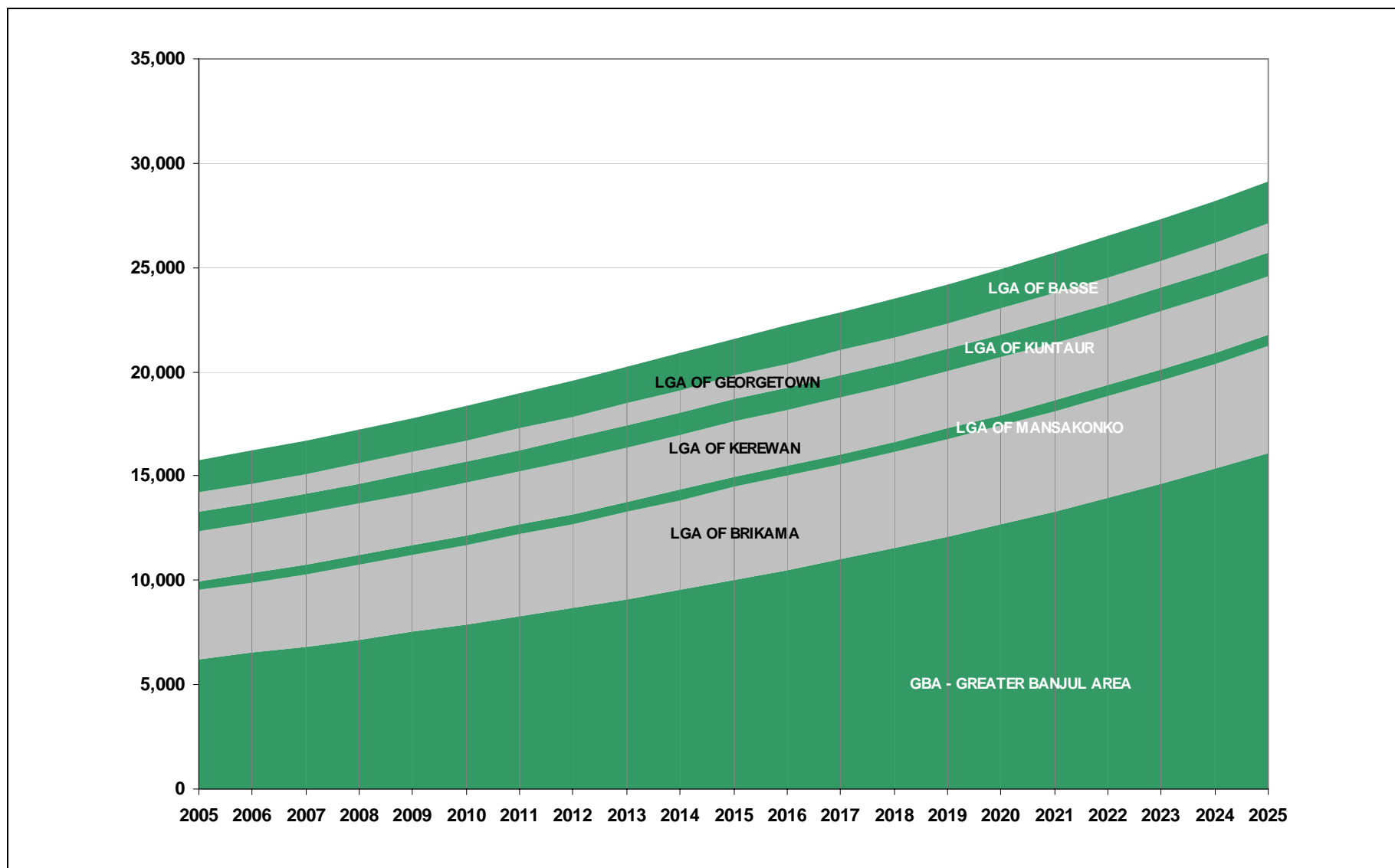


Figure 51: Projected Kerosene and Jet Demand in TOE/a (2005-2025)

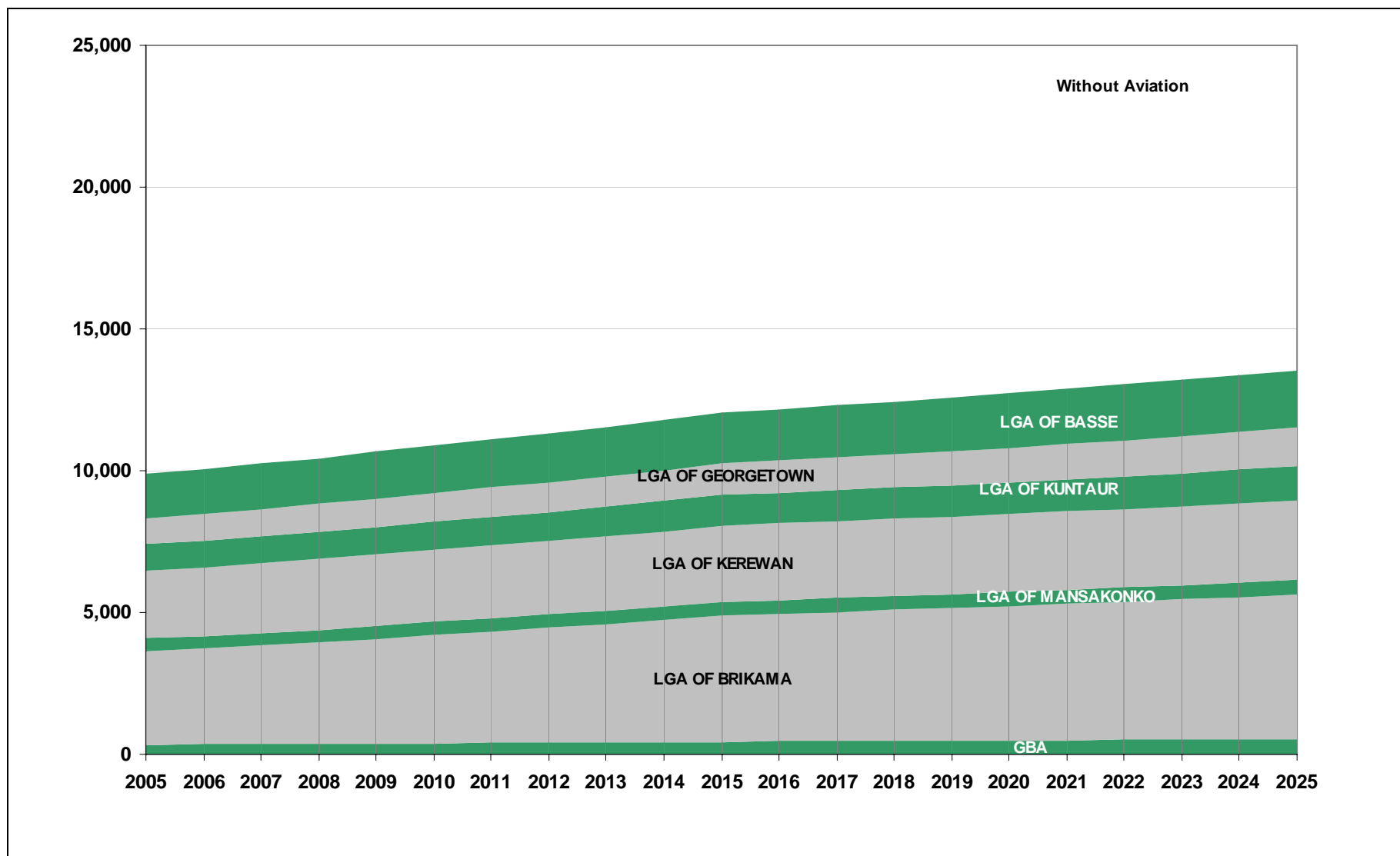


Figure 52: Projected Demand of Kerosene only in TOE/a (2005-2025)

8.2.6 Projected Liquefied Petroleum Gas Demand

Liquefied petroleum gas is an energy source, which is used in the Gambia's residential sector and the transport/aviation sector. Figure 53 demonstrates the expected increase in demand of LPG during the forecasted period. A division per region is included. This development is also reflected in selected time-slices in Table 23.

Comparable to the utilisation of kerosene and jet, there is also a difference in the consumption behaviour of LPG between urban and rural residents. However, unlike the kerosene and jet demand, the major consumers of LPG on residential level are and remain the inhabitants of urban regions. For the overall residential sector, an average annual growth rate of 4.1% are projected for the period between the base year and 2015, which is expected to be lower between 2015 and 2025. A reduction by an average of 1.8% points is expected over the second decade within the period under projection.

For the first decade, an annual average rate of increase of the entire demand by some 4.2% is expected. Between 2015 and 2025, the forecast results in a slightly higher rate with an average of 4.6% per year. Annex D.6 displays in detail the data of the LPG demand forecast in the Gambia for 2005-2025. It includes the absolute figures, a sectoral and a regional break down.

Table 23: LPG Demand Projection in TOE/a (2004-2025)

Entire LPG Demand						
		Base >>	2010	2015	2020	2025
Total Annual Demand	TOE/a	15,350	18,393	21,605	24,929	29,119
GBA - GREATER BANJUL AREA	TOE/a	6,090	7,883	10,009	12,698	16,122
LGA OF BRIKAMA	TOE/a	3,181	3,833	4,466	4,738	5,105
LGA OF MANSAKONKO	TOE/a	430	458	478	497	518
LGA OF KEREWAN	TOE/a	2,351	2,539	2,677	2,744	2,813
LGA OF KUNTAUR	TOE/a	893	995	1,071	1,124	1,180
LGA OF GEORGETOWN	TOE/a	906	1,023	1,122	1,224	1,348
LGA OF BASSE	TOE/a	1,498	1,661	1,783	1,903	2,034

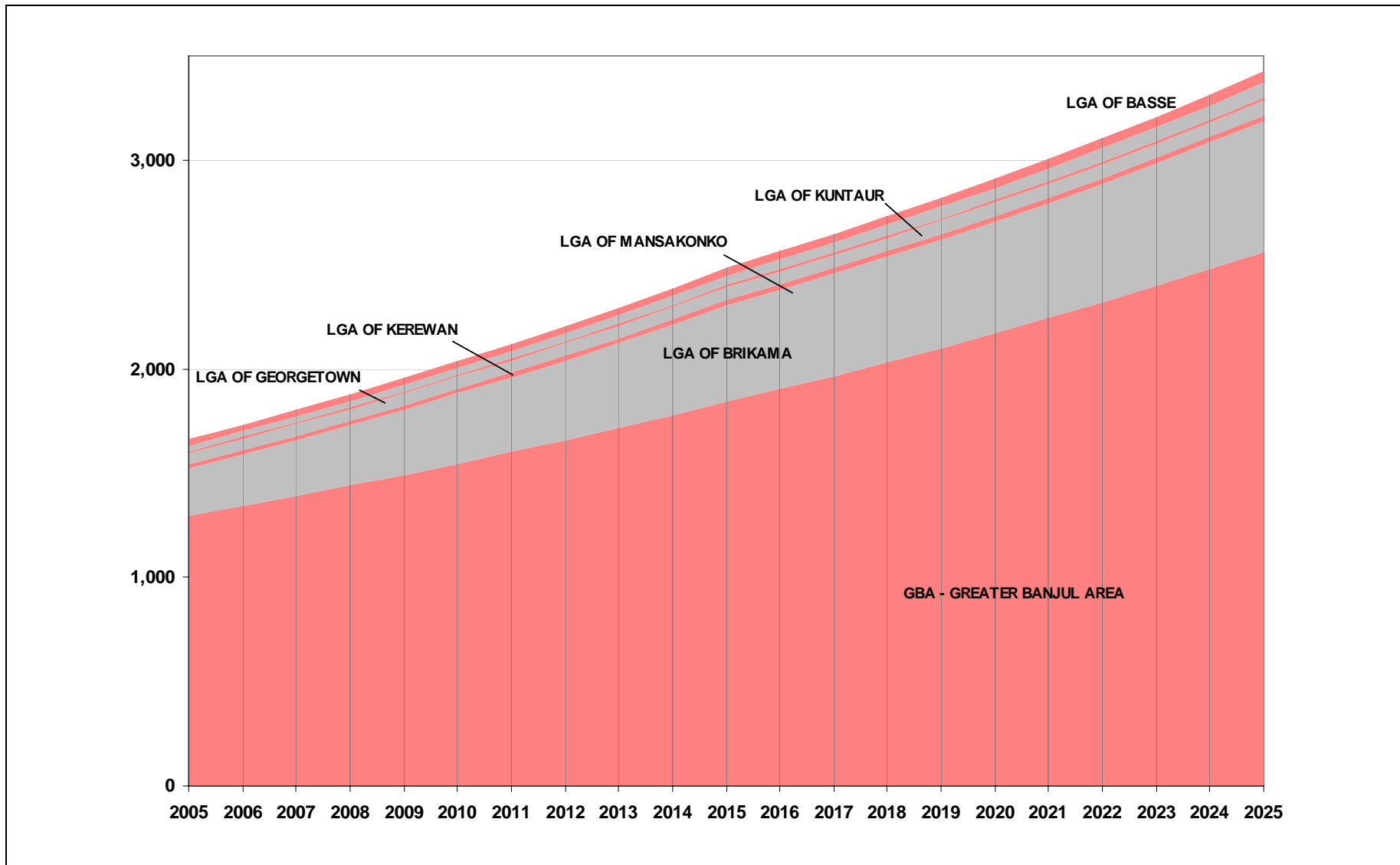


Figure 53: Projected LPG Demand (2005-2025)

8.2.7 Projected Electricity Demand

As already described in several previous sections, the forecast of the Gambia's electricity demand has a particular significance. Unlike the projected demand of the primary energy sources, the forecast of electricity includes also the projection of electricity requirements including the present and expected future suppressed demand. Figure 54 illustrates the gap between the currently covered electricity demand and the estimated actual requirement, which includes the suppressed demand. Furthermore, it is shown that only due to additional power supply (imports plus increasing domestic generation) this gap can be closed until 2010. The results of the forecast presented are comparable to these, published in NAWEC's own projections. The average annual growth rate for both the electricity demand at sent out level (including suppressed demand figures) is 12.8% from the base year 2004 on until 2010, 4.0% for the period 2010-2015, and approximately 3.6% in 2016-2025. Based on the assumption that the schedule for the several major electricity generation / supply projects can be followed, the annual average growth rate for the estimated demand, which can be served is thus 29.7% for the period between the base year and 2010. For the rest of the considered forecast period the rate of increase is naturally as high as for the entire electricity demand (2010-2015: 4.0%, 2016-2025: 3.6%).

A first overview of the electricity demand development in figures is provided in Table 24, whereas a detailed break-down is given in Annex D.7 of this report. The annex represents figures in detail for each individual customer group, as well as for the several regions of the Gambia. Concerning the latter matter Figure 55 illustrates the expected development of electricity demand for each region of the country. It is displayed, that the GBA will keep the largest proportion, but also illustrated is the increasing significance of the other provinces, which play only a minor role in the base year 2004.

Table 24: Electricity Demand Projection in TOE/a (2004-2025)

Entire Electricity Demand						
		Base	2010	2015	2020	2025
Total Annual Demand at Sent-Out Level (including Suppressed Demand)	MWh/a	289,079	596,016	724,164	847,450	1,016,900
Total Final Demand (including Suppressed Demand)	MWh/a	216,665	496,918	638,596	762,705	915,210
Total Losses	MWh/a	72,414	99,098	85,567	84,745	101,690
Total Annual Demand at Sent-Out Level (including Suppressed Demand)	TOE/a	24,861	51,257	62,278	72,881	87,453
Total Final Demand (including Suppressed Demand)	TOE/a	18,633	42,735	54,919	65,593	78,708
Total Losses	TOE/a	6,228	8,522	7,359	7,288	8,745

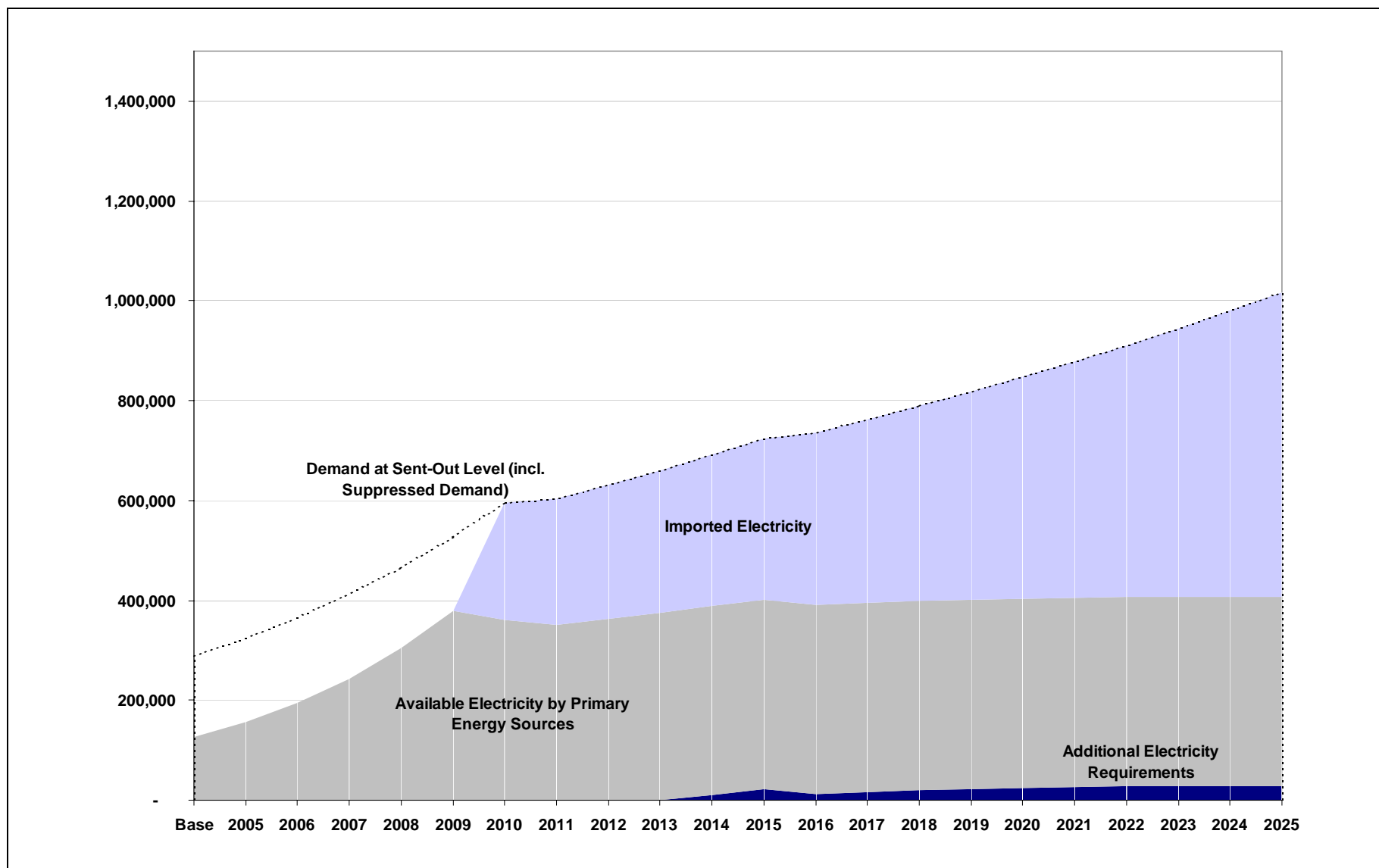


Figure 54: Projected Electricity Demand in MWh/a (2005-2025)

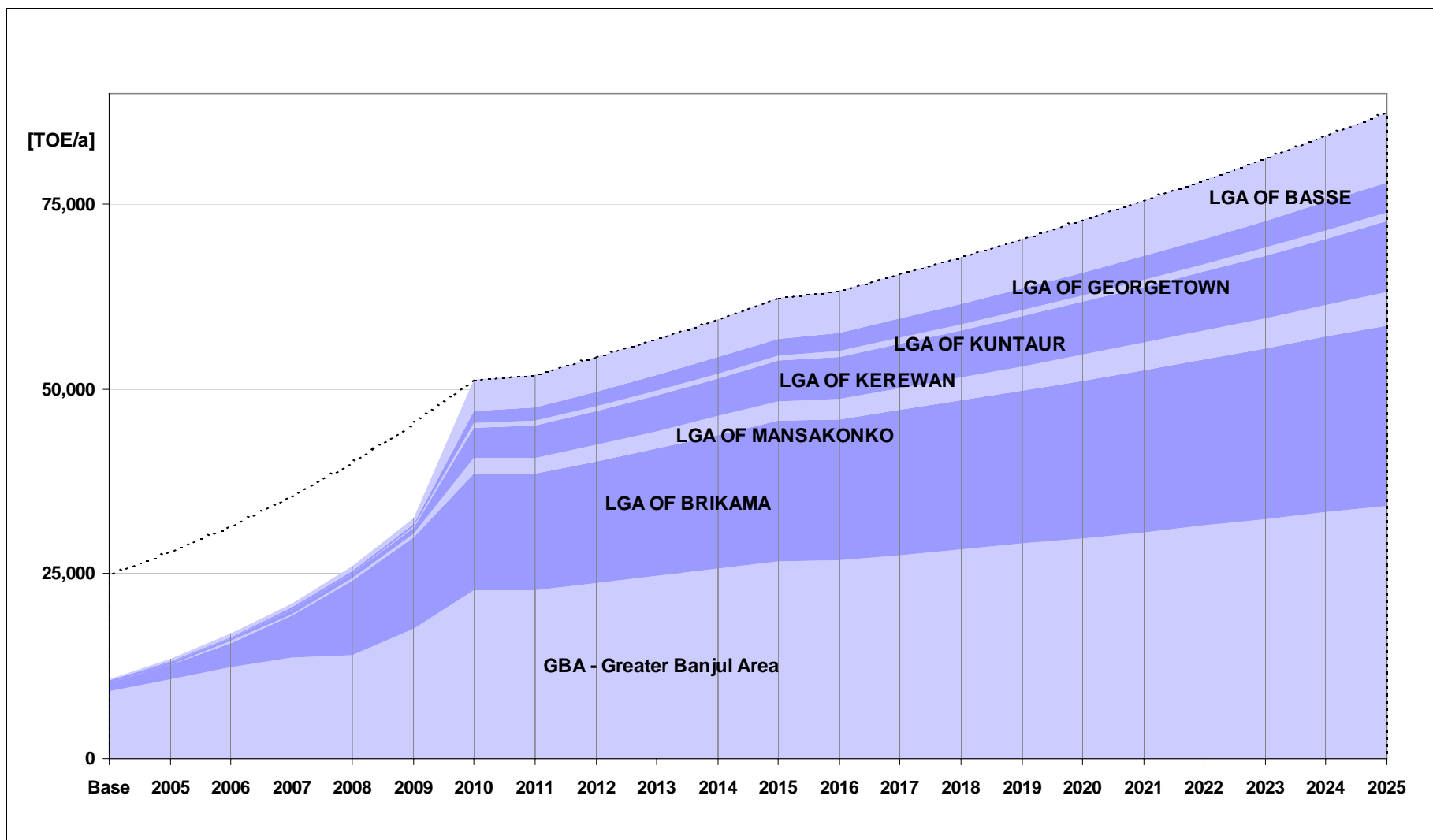


Figure 55: Projected Electricity Demand by Region in TOE/a (2005-2025)

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The Republic of The Gambia



Renewable Energy Study

"Energy Demand Assessment and Projection"

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Bad Vilbel – Germany

ANNEXES

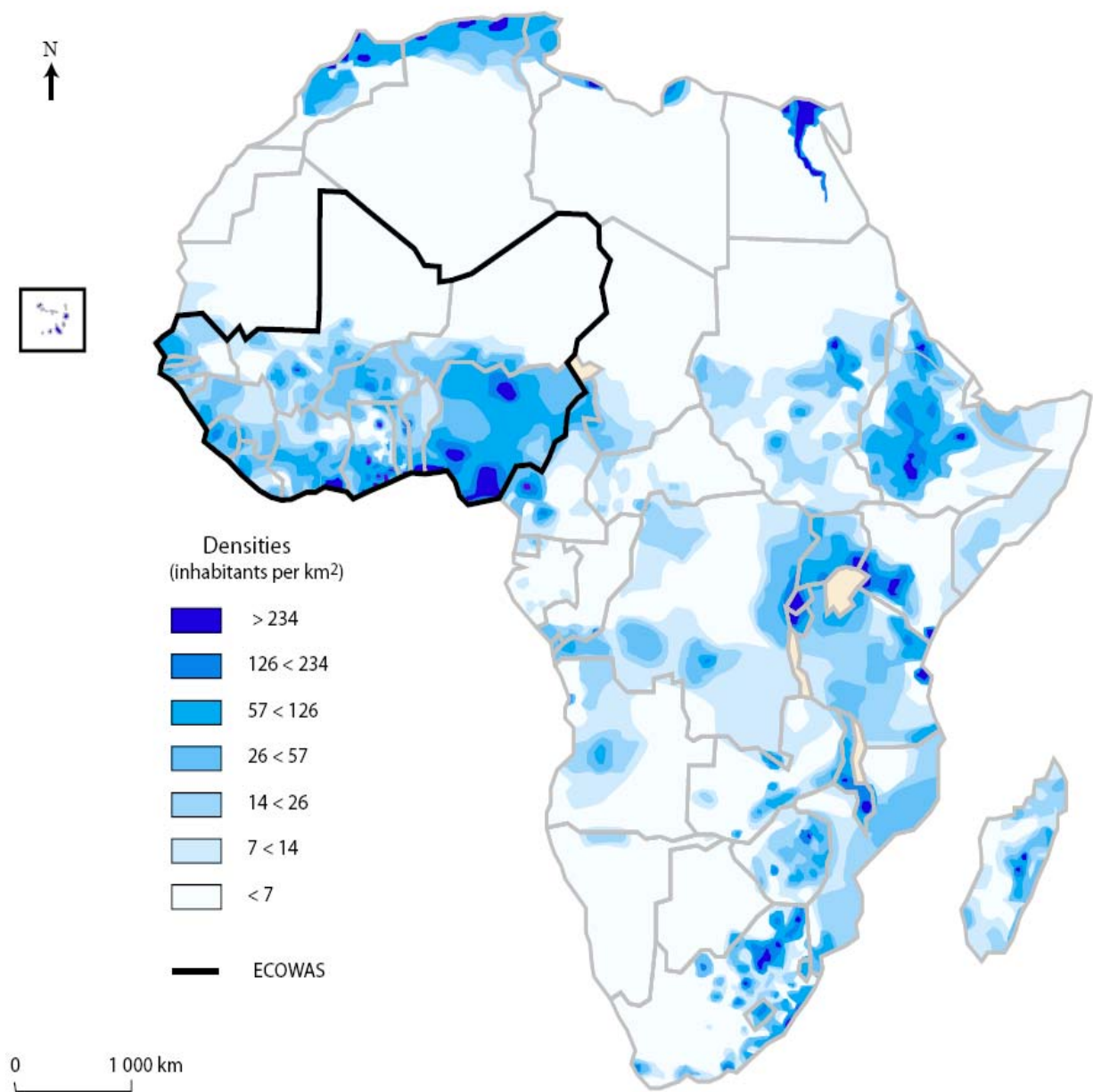
Annex (1)	Population Density in Africa (2000); Source: Groupe Villeret
Annex (2)	Demographic Figures per Region (2003); Source: Central Statistics Department of the Gambia
Annex (3)	Development of Urbanisation in the Gambia (1987-2006); Source: Central Statistics Department
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Annex (D.1)	Fuelwood Demand Forecast (2004-2025)
Annex (D.2)	Diesel Demand Forecast (2004-2025)
Annex (D.3)	HFO Demand Forecast (2004-2025)
Annex (D.4)	Gasoline Demand Forecast (2004-2025)
Annex (D.5)	Kerosene & Jet Demand Forecast (2004-2025)
Annex (D.6)	LPG Demand Forecast (2004-2025)
Annex (D.7)	Electricity Demand Forecast (2004-2025)

Annex (1)

Population Density in Africa (2000)

Source: Groupe Villeret



Annex (2)

Demographic Figures per Region (2003)

Source: Central Statistics Department of the Gambia

Local Government Area / District	Census 1993				Census 2003			
	Male [capita]	Poplation Female [capita]	Total [capita]	Households TOTAL [hh]	Households TOTAL [hh]	Total [capita]	Poplation Male [capita]	Female [capita]
THE GAMBIA	519,950	518,195	1,038,145	116,001	157,494	1,360,681	674,762	685,919
LGA OF BANJUL - URBAN ONLY	22,268	20,058	42,326	7,032	6,853	35,061	19,031	16,030
LGA OF BANJUL - URBAN ONLY / DISTRICT OF Banjul South	5,683	5,062	10,745	1,711	1,600	8,507	4,682	3,825
LGA OF BANJUL - URBAN ONLY / DISTRICT OF Banjul Central	5,628	5,401	11,029	1,897	1,860	8,822	4,709	4,113
LGA OF BANJUL - URBAN ONLY / DISTRICT OF Banjul North	10,957	9,595	20,552	3,424	3,290	17,499	9,515	7,984
LGA OF KANIFING - URBAN ONLY	118,257	109,957	228,214	31,426	49,016	322,735	164,208	158,527
LGA OF KANIFING - URBAN ONLY / DISTRICT OF K.U.D.C	118,257	109,957	228,214	31,426	49,016	322,410	164,054	158,356
LGA OF BRIKAMA	119,031	115,886	234,917	25,649	45,139	389,594	195,849	193,745
LGA OF BRIKAMA / DISTRICT OF Kombo North	41,053	39,425	80,478	9,086	20,590	166,351	84,199	82,152
LGA OF BRIKAMA / DISTRICT OF Kombo South	20,057	19,637	39,694	4,161	7,120	62,531	31,610	30,921
LGA OF BRIKAMA / DISTRICT OF Kombo Central	28,334	27,760	56,094	6,271	9,640	84,315	42,122	42,193
LGA OF BRIKAMA / DISTRICT OF Kombo East	10,681	10,347	21,028	2,160	3,080	28,146	14,008	14,138
LGA OF BRIKAMA / DISTRICT OF Foni Brefet	4,237	4,292	8,529	921	1,130	11,411	5,642	5,769
LGA OF BRIKAMA / DISTRICT OF Foni Bintang Karani	5,757	5,640	11,397	1,192	1,430	15,994	7,925	8,069
LGA OF BRIKAMA / DISTRICT OF Foni Kansala	3,820	3,928	7,748	832	1,180	12,247	6,024	6,223
LGA OF BRIKAMA / DISTRICT OF Foni Bondali	2,369	2,225	4,594	496	630	6,049	3,074	2,975
LGA OF BRIKAMA / DISTRICT OF Foni Jarrol	2,723	2,632	5,355	530	580	5,943	2,962	2,981

Local Government Area / District	Census 1993				Census 2003			
	Male [capita]	Poplation Female [capita]	Total [capita]	Households TOTAL [hh]	Households TOTAL [hh]	Total [capita]	Poplation Male [capita]	Female [capita]
THE GAMBIA	519,950	518,195	1,038,145	116,001	157,494	1,360,681	674,762	685,919
LGA OF MANSAKONKO	31,606	33,540	65,146	8,227	8,432	72,167	34,510	37,657
LGA OF MANSAKONKO / DISTRICT OF Kiang West	6,428	7,051	13,479	1,613	1,670	14,711	6,833	7,878
LGA OF MANSAKONKO / DISTRICT OF Kiang Central	3,536	3,746	7,282	857	930	7,886	3,721	4,165
LGA OF MANSAKONKO / DISTRICT OF Kiang East	2,923	3,433	6,356	739	660	6,534	3,085	3,449
LGA OF MANSAKONKO / DISTRICT OF Jarra West	10,094	10,579	20,673	3,066	3,220	24,416	11,831	12,585
LGA OF MANSAKONKO / DISTRICT OF Jarra Central	3,001	3,083	6,084	640	600	6,494	3,133	3,361
LGA OF MANSAKONKO / DISTRICT OF Jarra East	5,624	5,648	11,272	1,312	1,400	12,505	6,086	6,419
LGA OF KEREWAN	76,892	79,570	156,462	16,695	18,242	172,835	83,393	89,442
LGA OF KEREWAN / DISTRICT OF Lower Nuimi	17,692	17,455	35,147	3,811	4,840	44,491	21,960	22,531
LGA OF KEREWAN / DISTRICT OF Upper Nuimi	10,916	10,636	21,552	1,929	2,500	24,940	12,435	12,505
LGA OF KEREWAN / DISTRICT OF Jokadu	7,449	7,425	14,874	1,437	1,700	17,850	8,640	9,210
LGA OF KEREWAN / DISTRICT OF Lower Baddibu	6,732	7,659	14,391	1,653	1,670	15,157	6,965	8,192
LGA OF KEREWAN / DISTRICT OF Central Baddibu	7,196	7,864	15,060	1,661	1,660	14,998	7,227	7,771
LGA OF KEREWAN / DISTRICT OF Upper Baddibu	26,907	28,531	55,438	6,204	6,090	55,370	26,159	29,211

Local Government Area / District	Census 1993				Census 2003			
	Male	Population	Households	TOTAL [hh]	Households	Population	Male	Female
	[capita]	Female [capita]	Total [capita]		TOTAL [hh]	Total [capita]		
THE GAMBIA	519,950	518,195	1,038,145	116,001	157,494	1,360,681	674,762	685,919
LGA OF KUNTAUR	33,385	34,389	67,774	6,744	7,104	78,491	38,021	152,232
LGA OF KUNTAUR / DISTRICT OF Lower Saloum	6,901	7,278	14,179	1,534	1,350	13,524	6,413	7,111
LGA OF KUNTAUR / DISTRICT OF Upper Saloum	6,199	6,353	12,552	1,185	1,290	15,970	7,732	8,238
LGA OF KUNTAUR / DISTRICT OF Niani	3,223	3,216	6,439	549	710	8,205	4,000	4,205
LGA OF KUNTAUR / DISTRICT OF Niani	9,137	9,394	18,531	1,926	2,090	22,242	10,897	11,345
LGA OF KUNTAUR / DISTRICT OF Sami	7,925	8,148	16,073	1,550	1,710	19,157	9,271	9,886
LGA OF GEORGETOWN	43,673	44,574	88,247	8,836	10,115	107,212	51,891	55,321
LGA OF GEORGETOWN / DISTRICT OF Niamina Dankunku	3,125	2,964	6,089	663	710	6,000	2,837	3,163
LGA OF GEORGETOWN / DISTRICT OF Niamina West	2,897	3,051	5,948	637	640	6,630	3,202	3,428
LGA OF GEORGETOWN / DISTRICT OF Niamina East	7,635	7,767	15,402	1,600	1,950	19,034	9,156	9,878
LGA OF GEORGETOWN / DISTRICT OF Fulladu West	28,579	29,416	57,995	5,523	6,510	71,669	34,731	36,938
LGA OF GEORGETOWN / DISTRICT OF MacCarthy Island	1,437	1,376	2,813	413	440	3,466	1,770	1,696
LGA OF BASSE	74,838	80,221	155,059	11,392	12,593	182,586	87,897	94,689
LGA OF BASSE / DISTRICT OF Fulladu East	41,213	43,114	84,327	6,749	7,330	98,454	47,936	50,518
LGA OF BASSE / DISTRICT OF Kantora	12,476	14,026	26,502	1,365	1,590	30,402	14,392	16,010
LGA OF BASSE / DISTRICT OF Wuli	14,112	15,429	29,541	2,156	2,330	35,856	17,052	18,804
LGA OF BASSE / DISTRICT OF Sandu	7,037	7,652	14,689	1,122	1,210	18,321	8,736	9,585

Annex (3)

Development of Urbanisation in the Gambia (1987-2006)

Source: Central Statistics Department

Local Government Area / District	Census 1993			Census 2003			Census 1993 - 2003	
	Urban (capital)	Population Rural (capital)	Total [capita]	Total [capita]	Population Urban (capital)	Rural (capital)	Population Urban (capital)	Rural (capital)
THE GAMBIA	386,064	652,081	1,038,145	1,360,658	686,090	674,568	13.43%	0.51%
LGA OF BANJUL - URBAN ONLY	42,326	0	42,326	35,061	35,061	0	-1.87%	0.00%
LGA OF KANIFING - URBAN ONLY	228,214	0	228,214	322,735	322,735	0	3.53%	0.00%
LGA OF BRIKAMA	42,480	192,437	234,917	389,594	234,905	154,689	24.81%	2.01%
LGA OF MANSAKONKO	10,135	55,011	65,146	72,167	13,302	58,865	21.69%	-13.23%
LGA OF KEREWAN	33,328	123,134	156,462	172,835	34,720	138,115	17.89%	-11.89%
LGA OF KUNTAUR	5,357	62,417	67,774	78,491	5,040	73,451	30.79%	-22.25%
LGA OF GEORGETOWN	8,163	80,084	88,247	107,212	16,598	90,614	29.37%	-14.56%
LGA OF BASSE	16,061	138,998	155,059	182,563	23,729	158,834	27.52%	-16.20%

Annex (4)

Selected Macroeconomic Indicators (1987-2006)

Source: "World Economic Outlook", International Monetary Fund, April 2005

The Gambia and Selected African Countries, Annual Percent Change of Consumer Prices (1987 - 2006)

Country	Average 87-96	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Central African Republic	2.6	1.6	-1.9	-1.4	3.2	3.8	2.3	4.2	-2.2	2.5	2.5
Rep. of Congo	3.3	13.1	1.8	3.1	0.4	0.8	3.1	1.5	2.0	2.0	2.0
Angola	313.3	221.5	107.4	248.2	325.0	152.6	108.9	98.3	43.6	20.1	11.7
Zambia	85.5	24.4	24.5	26.8	26.1	21.7	22.2	21.5	18.0	16.2	12.3
Sudan	84.8	46.7	17.1	16.0	8.0	4.9	8.3	7.7	8.4	7.5	7.0
The Gambia	8.8	2.8	1.1	3.8	0.9	4.5	8.6	17.0	14.6	7.1	5.2

* Figures for selected years are IMF staff estimates / projections

The Gambia and Selected African Countries, Annual Percentage Change of Real GDP (1987 - 2006)

Country	Average 87-96	1997	1998	1999	2000	2001	2002	2003	2004	2005*	2006*
Central African Republic	-1.7	7.5	3.9	3.6	1.8	0.3	-0.6	-7.0	0.9	3.5	4.0
Rep. of Congo	5.0	-0.6	3.7	-3.0	8.2	3.6	5.4	0.8	4.0	9.2	4.7
Angola	-0.1	7.9	6.8	3.2	3.0	3.1	14.4	3.4	11.2	13.8	24.5
Zambia	-0.3	3.3	-1.9	2.2	3.6	4.9	3.3	5.1	5.0	5.0	5.0
Sudan	3.3	9.3	5.7	6.5	6.9	6.1	6.0	6.0	7.3	8.3	8.6
The Gambia	3.3	4.9	6.5	6.4	5.5	5.8	-3.2	6.7	7.7	5.0	4.8

* Figures for selected years are IMF staff estimates / projections

Annex (5)

Projection of Growth Rate of Selected Indicators (2004-2010)

**Source: Department of State for Finance and Economic Affairs;
Central Statistics Department, 2005**

The Gambia: Selected National Accounts Indicators, 2004-2010
(Annual Percentage Change; in constant Prices)

	2004	2005	2006	2007	2008	2009	2010	Average	Average
		Proj.	Proj.	Proj.	Proj.	Proj.	Proj.	1997-2004	2005-2010
Agriculture	11.4	4.5	4.5	4.5	4.5	4.4	4.4	6.9	4.4
Groundnut Production	29.6	3.0	3.0	3.0	3.0	3.0	3.0	20.1	3.0
Other Crop Production	8.5	6.6	5.0	5.0	4.8	4.6	4.6	6.1	5.1
Livestock	3.2	2.3	5.0	5.0	5.0	5.0	5.0	4.3	4.6
Forestry	3.1	3.7	5.0	5.0	5.0	5.0	5.0	4.3	4.8
Fishing	10.0	3.8	3.8	3.8	5.0	5.0	5.0	1.8	4.4
Industry	3.3	2.7	5.9	5.0	5.0	5.0	5.0	4.9	4.8
Manufacturing	5.7	1.2	6.0	5.0	5.0	5.0	5.0	2.9	4.5
Large & Medium Manuf.	6.0	1.1	6.0	5.0	5.0	5.0	5.0	2.9	4.5
Small Scale Manuf.	5.0	1.3	6.0	5.0	5.0	5.0	5.0	2.7	4.6
Construction and Mining	3.5	3.8	6.0	5.0	5.0	5.0	5.0	7.1	5.0
Electricity & Water	-13.0	5.0	5.0	5.0	5.0	5.0	5.0	4.7	5.0

The Gambia: Selected National Accounts Indicators, 2004-2010 (Continuation)
(Annual Percentage Change; in constant Prices)

	2004	2005	2006	2007	2008	2009	2010	Average	Average
		Proj.	Proj.	Proj.	Proj.	Proj.	Proj.	1997-2004	2005-2010
Services	3.2	5.1	4.6	4.5	4.5	4.5	4.6	4.3	4.6
Trade	0.4	2.4	5.5	4.7	4.7	4.7	4.7	3.1	4.5
Groundnuts	2.5	-1.0	3.0	3.0	3.0	3.0	3.0	5.0	2.3
Others	0.0	3.0	6.0	5.0	5.0	5.0	5.0	2.8	4.8
Hotels & Restaurants	8.4	3.0	6.0	6.0	6.0	6.0	6.0	6.1	5.5
Transport and Communications	5.1	9.2	5.0	5.0	5.0	5.0	5.0	5.9	5.7
Transport	3.0	2.8	5.0	5.0	5.0	5.0	5.0	4.0	4.6
Communications	6.5	13.5	5.0	5.0	5.0	5.0	5.0	8.0	6.4
Real Estate & Business Services	2.2	2.0	3.0	3.0	3.0	3.0	3.0	2.7	2.8
Other Services	2.2	0.0	3.0	3.0	8.0	8.0	8.0	2.2	5.0
Public Administration	0.0	2.3	3.0	3.0	2.0	2.0	2.0	3.4	2.4

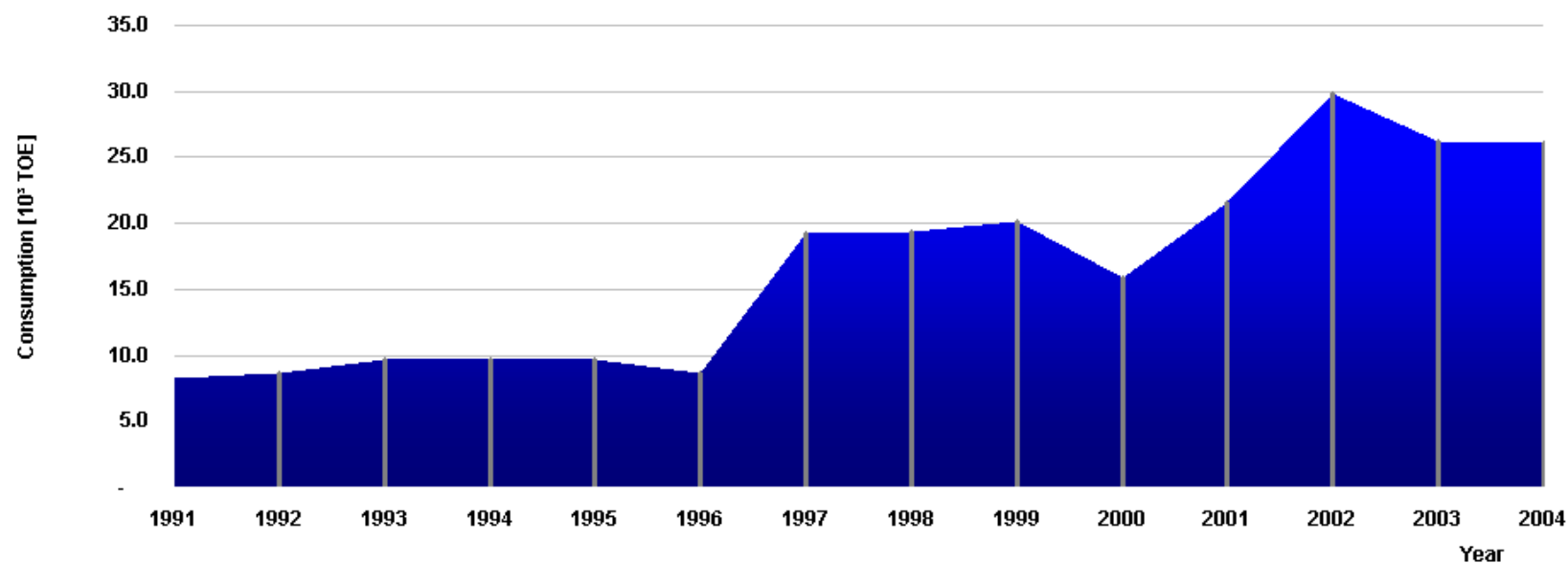
Annex (6)

Development of Energy Consumption (1991-2004)

Petroleum-Products

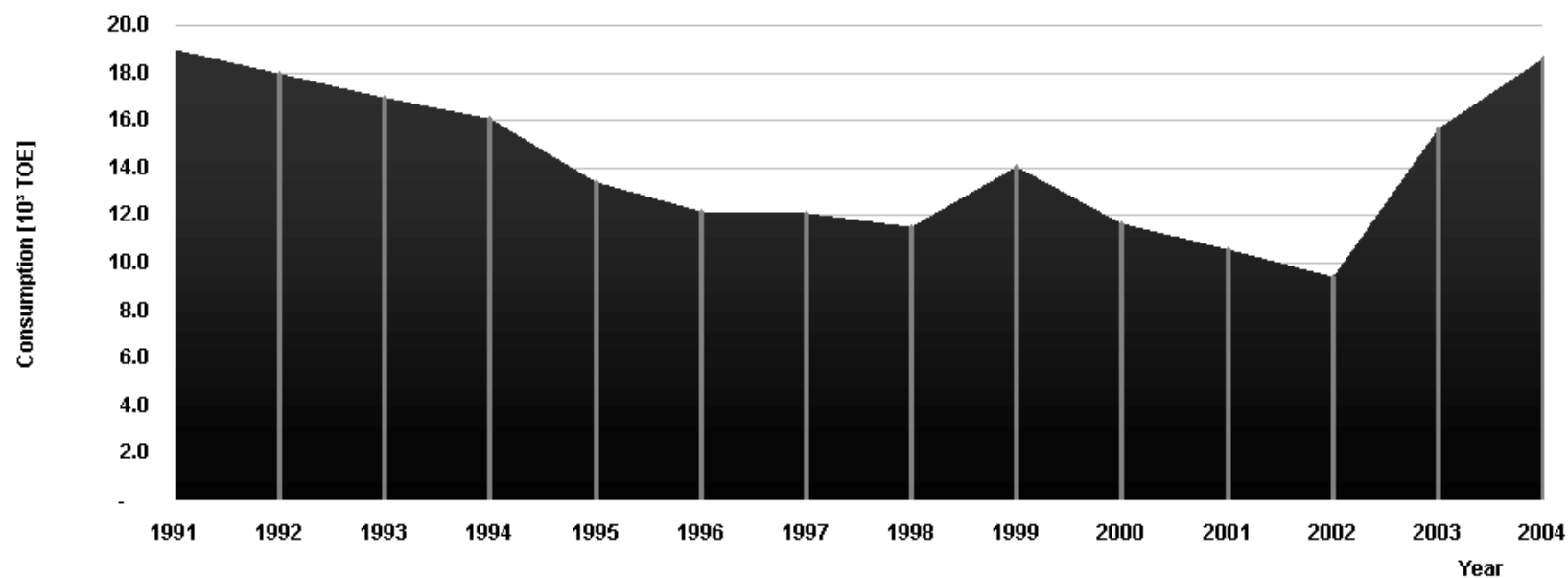
Development of Energy Consumption - Heavy Fuel Oil

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Consumption [10 ⁸ TOE]	8.23	8.65	9.70	9.71	9.66	8.68	19.28	19.40	20.10	15.90	21.56	29.81	26.23	26.07
Annual Growth Rate	76.2%	5.1%	12.1%	0.1%	-0.4%	-10.2%	122.2%	0.6%	3.6%	-20.9%	35.6%	38.3%	-12.0%	-0.6%



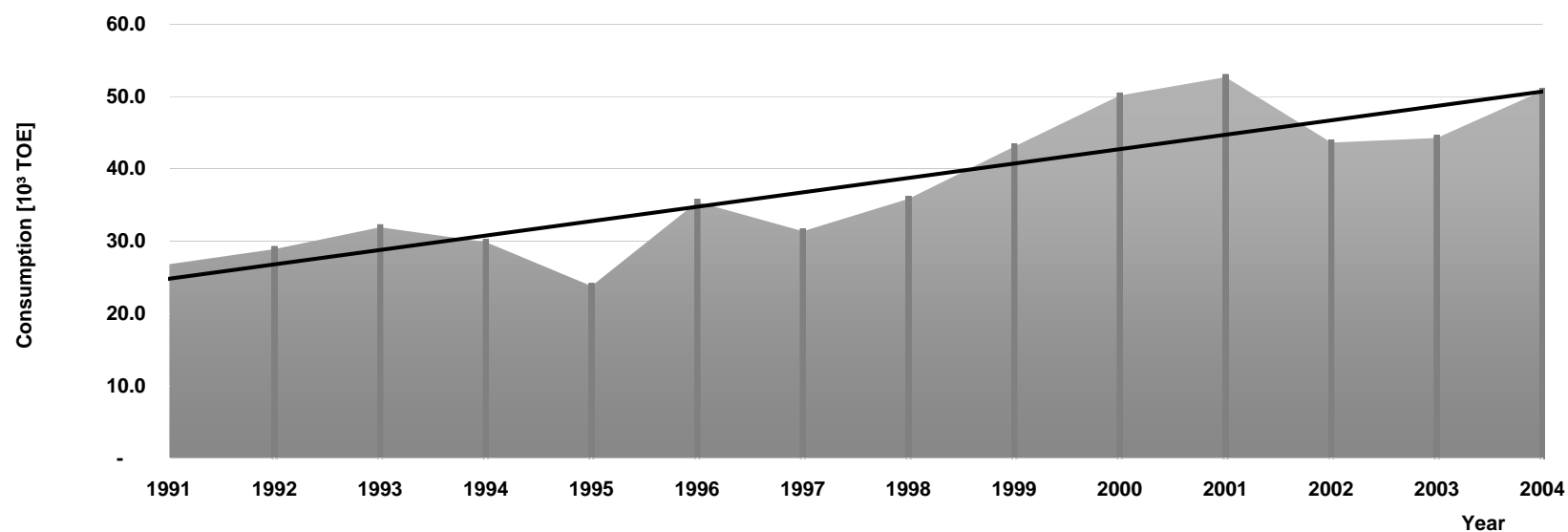
Development of Energy Consumption - Gasoline

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Consumption [10 ³ TOE]	18.96	17.97	16.98	16.12	13.38	12.18	12.10	11.50	14.05	11.69	10.60	9.42	15.66	18.60
Annual Growth Rate	4.6%	-5.2%	-5.5%	-5.1%	-17.0%	-9.0%	-0.7%	-4.9%	22.2%	-16.8%	-9.4%	-11.1%	66.2%	18.8%



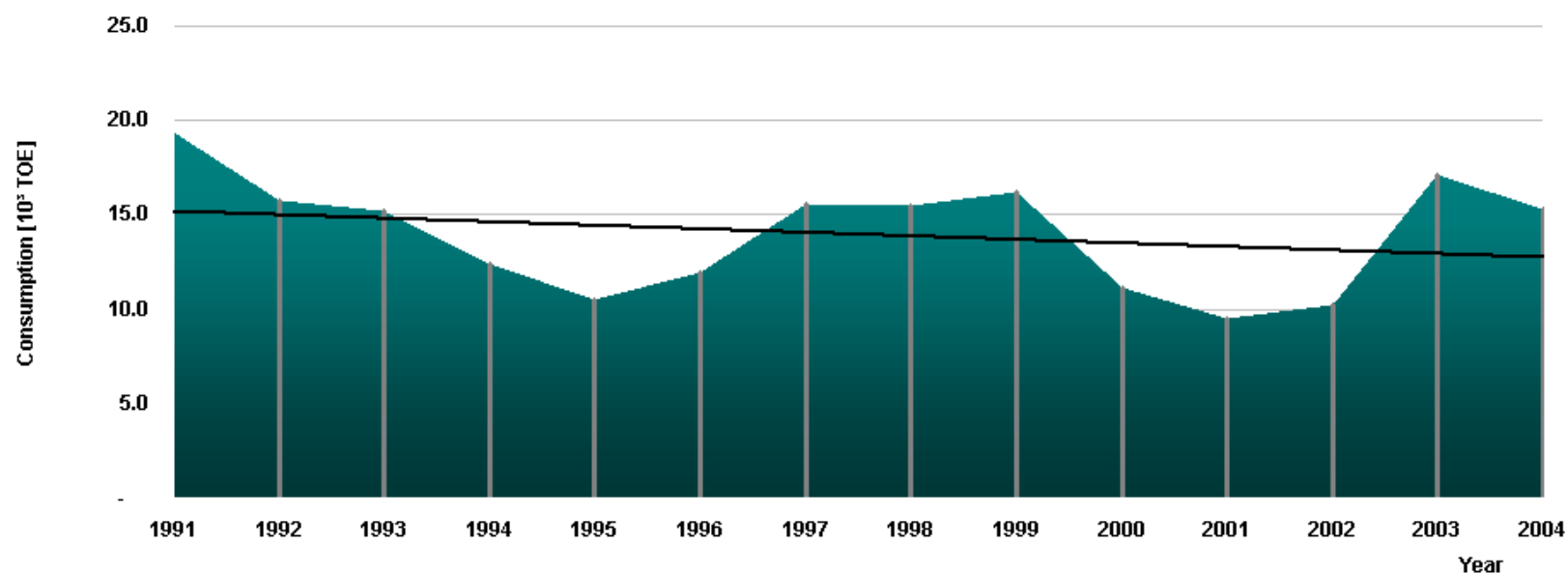
Development of Energy Consumption - Diesel

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Consumption [10 ³ TOE]	26.82	28.94	31.94	29.87	23.82	35.42	31.41	35.87	43.07	50.13	52.66	43.61	44.27	50.79
Annual Growth Rate	-13.8%	7.9%	10.4%	-6.5%	-20.3%	48.7%	-11.3%	14.2%	20.0%	16.4%	5.1%	-17.2%	1.5%	14.7%



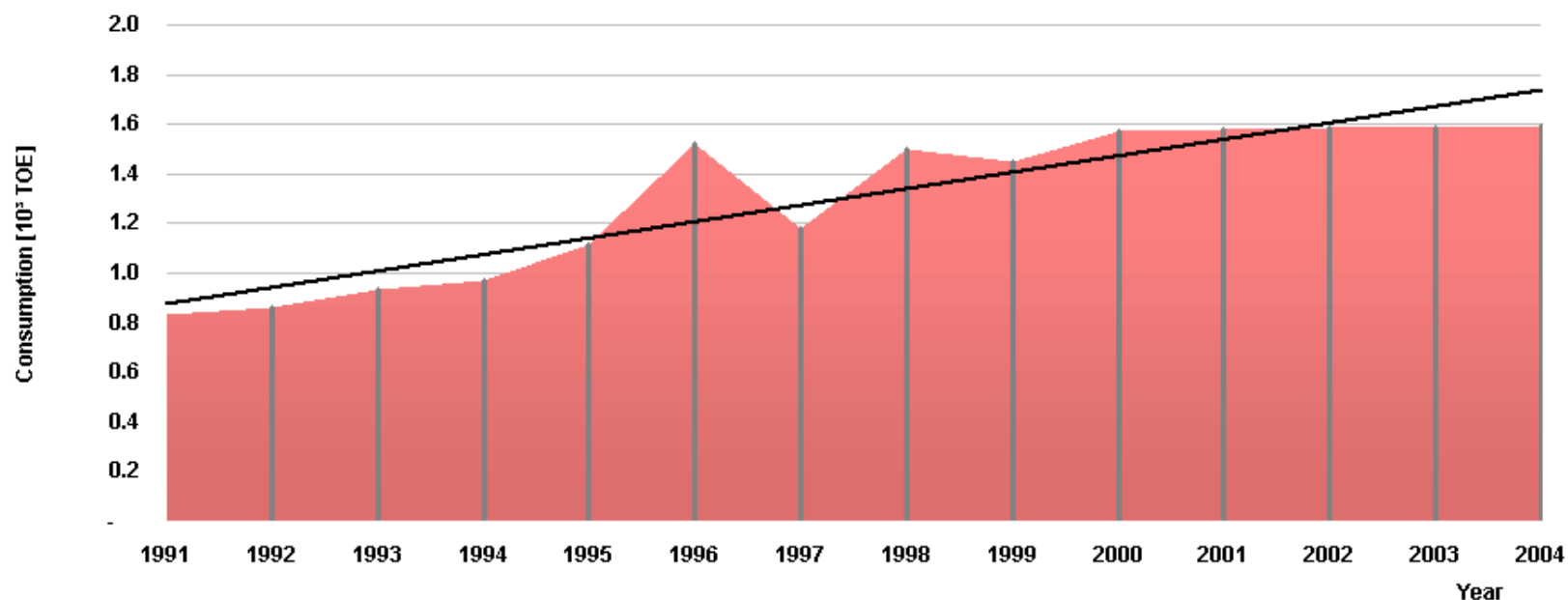
Development of Energy Consumption - Kerosene / Jet

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Consumption [10 ³ TOE]	19.35	15.74	15.22	12.40	10.52	11.97	15.54	15.47	16.17	11.11	9.48	10.27	17.15	15.35
Annual Growth Rate	-5.1%	-18.7%	-3.3%	-18.5%	-15.2%	13.8%	29.9%	-0.4%	4.5%	-31.3%	-14.7%	8.3%	67.0%	-10.5%



Development of Energy Consumption - Energy Source: Liquefied Petroleum Gas (LPG)

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Consumption [10 ³ TOE]	0.84	0.86	0.93	0.97	1.12	1.52	1.18	1.50	1.45	1.58	1.58	1.58	1.59	1.59
Annual Growth Rate	3.2%	3.4%	8.0%	4.2%	15.0%	36.2%	-22.5%	27.2%	-3.5%	8.7%	0.3%	0.3%	0.4%	0.2%



Annex (7)

Primary Energy Use by Sector

Proportion of Primary Energy Use (2004)						
Sector	Diesel	HFO	Kerosene/Jet	Gasoline	LPG	Wood
Residential	0.1%	0.0%	0.9%	0.0%	0.3%	98.7%
Industrial	83.0%	17.0%	0.0%	0.0%	0.0%	0.0%
Commercial	29.6%	0.0%	0.0%	0.8%	4.1%	65.5%
Transport / Aviation	58.2%	0.0%	16.9%	24.9%	0.0%	0.0%
Agriculture / Fishing	30.4%	0.0%	0.0%	69.6%	0.0%	0.0%
Energy Industry	5.9%	94.1%	0.0%	0.0%	0.0%	0.0%

Annex (8)

Use of Energy Sources for Cooking in Households

(Urban and Rural Areas)

Banjul City Council	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	35061	58.8%	0.7%	0.1%	31.4%	8.8%	0.1%	0.0%	0.1%
Rural	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Kanifing Council	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	322735	78.6%	0.3%	0.0%	9.6%	9.8%	0.1%	0.0%	1.4%
Rural	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Brikama	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	234905	93.1%	0.2%	0.1%	2.8%	3.3%	0.1%	0.0%	0.5%
Rural	154689	97.3%	0.3%	0.1%	1.4%	0.8%	0.0%	0.0%	0.0%

Mansakonko	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	13302	87.0%	0.3%	0.2%	7.9%	3.7%	0.1%	0.0%	0.8%
Rural	58865	99.2%	0.2%	0.1%	0.2%	0.4%	0.0%	0.0%	0.0%

Kerewan	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	34720	94.8%	0.2%	0.1%	1.0%	3.8%	0.0%	0.0%	0.0%
Rural	138115	98.7%	0.3%	0.2%	0.1%	0.7%	0.0%	0.1%	0.0%

Kuntaur	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	5040	97.6%	0.0%	0.4%	0.4%	1.7%	0.0%	0.0%	0.0%
Rural	73451	99.4%	0.1%	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%

Janjanbureh	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	16598	94.2%	0.3%	0.4%	1.5%	3.6%	0.0%	0.1%	0.0%
Rural	90614	99.3%	0.1%	0.1%	0.1%	0.4%	0.0%	0.0%	0.0%

Basse	Population	Main Cooking Fuel [%]							
	[capita]	Firewood	Kerosene	Briquette	Charcoal	Gas	Electricity	Solar	Saw Dust
Urban	23729	91.9%	0.3%	0.3%	5.3%	2.3%	0.0%	0.0%	0.0%
Rural	158834	98.9%	0.3%	0.2%	0.4%	0.2%	0.0%	0.0%	0.0%

Annex (9)

Use of Energy Sources for Lighting in Households

(Urban and Rural Areas)

Banjul City Council	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	35061	75.2%	0.5%	0.5%	23.7%	0.0%	0.0%
Rural	0	n/a	n/a	n/a	n/a	n/a	n/a

Kanifing Council	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	322735	57.8%	1.1%	3.9%	36.9%	0.3%	0.0%
Rural	0	n/a	n/a	n/a	n/a	n/a	n/a

Brikama	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	234905	17.7%	2.0%	18.3%	60.0%	1.9%	0.0%
Rural	154689	1.0%	1.6%	52.6%	43.3%	1.4%	0.1%

Mansakonko	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	13302	32.8%	1.1%	14.2%	54.1%	0.4%	0.0%
Rural	58865	3.3%	0.7%	25.3%	69.4%	1.2%	0.1%

Kerewan	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	34720	24.6%	1.6%	15.3%	56.7%	1.8%	0.1%
Rural	138115	0.5%	0.4%	62.7%	35.1%	1.3%	0.1%

Kuntaur	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	5040	0.0%	2.1%	17.7%	77.2%	2.6%	0.3%
Rural	73451	0.6%	0.3%	46.3%	50.4%	0.7%	1.6%

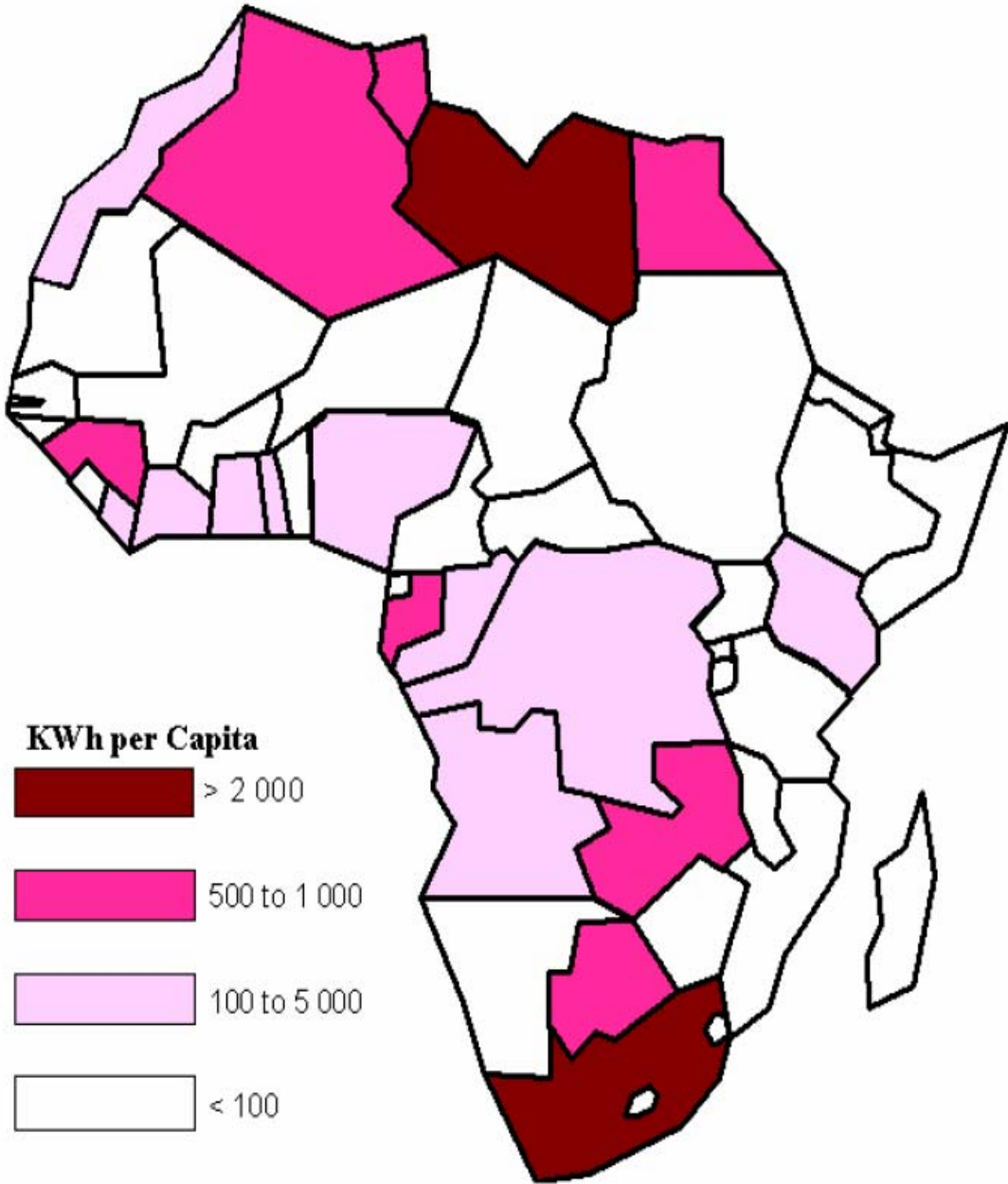
Janjanbureh	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	16598	33.4%	1.6%	16.0%	48.6%	0.3%	0.0%
Rural	90614	0.5%	0.6%	36.2%	60.9%	0.9%	0.9%

Basse	Population	Main Source of lighting [%]					
	[capita]	Electricity (NAWEC)	Electricity (Generator)	Kerosene Lamps	Candle	Solar	Firewood
Urban	23729	12.0%	3.2%	16.0%	66.7%	1.9%	0.0%
Rural	158834	0.9%	0.7%	34.5%	60.1%	2.9%	1.0%

Annex (10)

Electricity Consumption per Year and Capita in Africa

Source: United Nations – Human Development Figures



Annex (11)

Monthly Billed Electricity Consumption (2004)

NAWEC - Service Area

Sector / Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Domestic	4,959	3,437	3,121	3,271	3,912	3,645	3,581	3,269	3,535	3,041	3,186	4,740	43,697
Commercial	1,092	761	741	665	893	817	794	733	753	651	736	1,120	9,756
Maximum Demand	2,965	1,831	2,018	2,095	2,125	2,082	2,304	2,394	2,163	2,112	2,132	2,711	26,932
Agriculture	0.4	0.3	0.2	0.4	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.5	4.2
Institutional	561	589	412	627	536	697	769	731	671	741	548	594	7,476
TOTAL	9,577	6,618	6,292	6,658	7,466	7,241	7,448	7,127	7,122	6,545	6,602	9,166	87,865

Annex (D.0)

Demographic Development (2004-2025)

D0.1 Assumptions

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,360				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	GBA - Greater Banjul Area - Annual Growth (Urban)	%	2.8	2.8	2.8	2.7	2.0
3	LGA OF BRIKAMA - Annual Growth (Urban)	%	9.3	9.3	9.3	7.0	3.0
4	LGA OF MANSAKONKO - Annual Growth (Urban)	%	2.8	2.8	2.8	2.7	2.0
5	LGA OF KEREWAN - Annual Growth (Urban)	%	0.4	0.4	0.4	0.4	0.4
6	LGA OF KUNTAUR - Annual Growth (Urban)	%	-0.6	-0.6	-0.6	0.0	0.0
7	LGA OF GEORGETOWN - Annual Growth (Urban)	%	7.4	7.4	7.4	7.3	6.0
8	LGA OF BASSE - Annual Growth (Urban)	%	4.0	4.0	4.0	3.9	3.0
9	LGA OF BRIKAMA - Annual Growth (Rural)	%	-2.2	-2.2	-2.2	-2.3	-2.5
10	LGA OF MANSAKONKO - Annual Growth (Rural)	%	0.7	0.7	0.7	0.6	0.6
11	LGA OF KEREWAN - Annual Growth (Rural)	%	1.2	1.2	1.2	1.1	0.5
12	LGA OF KUNTAUR - Annual Growth (Rural)	%	1.6	1.6	1.6	1.5	1.0
13	LGA OF GEORGETOWN - Annual Growth (Rural)	%	1.2	1.2	1.2	1.1	1.0
14	LGA OF BASSE - Annual Growth (Rural)	%	1.3	1.3	1.3	1.2	1.2
15	Average Householdsize	cap	8.6				
16	GBA - Greater Banjul Area - Householdsize Change Derivation of Urban from Average	%	-1.0	0			
17	LGA OF BRIKAMA - Householdsize Change Derivation of Urban from Average	%	-0.6	4			
18	LGA OF MANSAKONKO - Householdsize Change Derivation of Urban from Average	%	0.8	23			
19	LGA OF KEREWAN - Householdsize Change Derivation of Urban from Average	%	0	19			
20	LGA OF KUNTAUR - Householdsize Change Derivation of Urban from Average	%	1	25			
21	LGA OF GEORGETOWN - Householdsize Change Derivation of Urban from Average	%	0.4	26			
22	LGA OF BASSE - Householdsize Change Derivation of Urban from Average	%	0.8	30			

D0.2 Projection

Residential Sector																								
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
Total Population	T	1361	1438	1481	1526	1576	1628	1685	1734	1787	1842	1901	1963	1997	2033	2070	2107	2146	2187	2228	2271	2315	2360	
Total Urban Population	T	686	757	797	840	885	934	987	1033	1082	1134	1188	1246	1279	1312	1346	1382	1418	1455	1493	1533	1574	1616	
Total Rural Population	T	675	680	684	687	690	694	698	701	705	708	712	716	718	721	723	726	729	732	735	738	741	744	
Percentage from Total - Urban Areas	%	50.4	52.7	53.8	55.0	56.2	57.4	58.6	59.6	60.6	61.5	62.5	63.5	64.0	64.5	65.0	65.6	66.0	66.5	67.0	67.5	68.0	68.5	
Percentage from Total - Rural Areas	%	49.6	47.3	46.2	45.0	43.8	42.6	41.4	40.4	39.4	38.5	37.5	36.5	36.0	35.5	35.0	34.4	34.0	33.5	33.0	32.5	32.0	31.5	

Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Population	T	358	378	388	399	410	421	433	445	457	469	482	495	504	515	525	535	546	557	568	580	591	603
LGA OF BRIKAMA - Population	T	390	429	452	477	505	536	571	599	629	661	696	733	749	765	782	799	817	836	856	876	897	919
LGA OF MANSAKONKO - Population	T	72	74	74	75	76	77	78	79	79	80	81	82	83	83	84	85	86	86	87	88	89	90
LGA OF KEREWAN - Population	T	173	176	178	180	182	184	185	187	189	191	193	195	195	196	197	198	199	200	201	202	203	204
LGA OF KUNTAUR - Population	T	78	81	82	83	84	86	87	88	89	91	92	93	94	95	96	97	98	99	100	101	102	103
LGA OF GEORGETOWN - Population	T	107	112	114	117	120	123	126	129	132	135	139	143	146	150	153	157	161	165	170	175	179	184
LGA OF BASSE - Population	T	183	189	192	195	198	202	205	208	212	215	219	222	226	229	232	236	239	243	246	250	254	258
Non Greater Banjul Area - Population Total		1003	1060	1092	1127	1166	1207	1252	1290	1330	1373	1419	1468	1493	1518	1545	1572	1600	1630	1660	1691	1724	1757
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Household number	T	55.9	60.2	62.5	64.9	67.3	69.9	72.5	75.2	78.0	81.0	84.0	87.1	89.8	92.5	95.3	98.2	101.2	104.2	107.4	110.6	114.0	117.4
LGA OF BRIKAMA - Household number	T	45.1	50.3	53.3	56.6	60.3	64.4	69.0	72.8	76.9	81.3	86.1	91.3	93.8	96.4	99.1	101.9	104.9	107.9	111.1	114.5	117.9	121.5
LGA OF MANSAKONKO - Household number	T	8.43	8.5	8.6	8.6	8.6	8.6	8.7	8.7	8.7	8.7	8.7	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.9	8.9
LGA OF KEREWAN - Household number	T	18.24	18.6	18.8	19.0	19.2	19.4	19.6	19.8	19.9	20.1	20.3	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5
LGA OF KUNTAUR - Household number	T	7.10	7.2	7.3	7.3	7.3	7.4	7.4	7.4	7.5	7.5	7.5	7.6	7.6	7.6	7.6	7.6	7.6	7.5	7.5	7.5	7.5	7.5
LGA OF GEORGETOWN - Household number	T	10.12	10.5	10.7	10.9	11.1	11.4	11.6	11.8	12.1	12.3	12.6	12.9	13.1	13.4	13.7	14.0	14.3	14.6	14.9	15.3	15.6	16.0
LGA OF BASSE - Household number	T	12.59	12.9	13.0	13.1	13.2	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Population Urban	T	358	378	388	399	410	421	433	445	457	469	482	495	504	515	525	535	546	557	568	580	591	603
LGA OF BRIKAMA - Population Urban	T	235	281	307	336	367	401	439	470	503	538	575	616	634	653	673	693	714	735	757	780	803	827
LGA OF MANSAKONKO - Population Urban	T	13	14	14	15	15	16	16	17	17	17	18	18	19	19	20	20	20	21	21	22	22	22
LGA OF KEREWAN - Population Urban	T	35	35	35	35	35	36	36	36	36	36	36	36	37	37	37	37	37	37	37	38	38	38
LGA OF KUNTAUR - Population Urban	T	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
LGA OF GEORGETOWN - Population Urban	T	17	19	21	22	24	25	27	29	31	34	36	39	41	44	46	49	52	55	58	62	66	69
LGA OF BASSE - Population Urban	T	24	26	27	28	29	30	31	32	34	35	36	38	39	40	41	42	44	45	46	48	49	51

Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Population Rural	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF BRIKAMA - Population Rural	T	155	148	145	141	138	135	132	129	126	123	120	118	115	112	109	106	104	101	98	96	94	91
LGA OF MANSAKONKO - Population Rural	T	59	60	60	60	61	61	62	62	62	63	63	64	64	64	65	65	65	66	66	67	67	67
LGA OF KEREWAN - Population Rural	T	138	141	143	145	146	148	150	151	153	155	156	158	159	160	160	161	162	163	164	164	165	166
LGA OF KUNTAUR - Population Rural	T	73	76	77	78	80	81	82	83	85	86	87	88	89	90	91	92	93	94	95	96	97	98
LGA OF GEORGETOWN - Population Rural	T	91	93	94	95	96	97	99	100	101	102	103	104	105	106	107	108	109	110	112	113	114	115
LGA OF BASSE - Population Rural	T	159	163	165	167	169	172	174	176	178	180	182	185	187	189	191	193	195	198	200	202	205	207
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Household number Urban	T	55.9	60.2	62.5	64.9	67.3	69.9	72.5	75.2	78.0	81.0	84.0	87.1	89.8	92.5	95.3	98.2	101.2	104.2	107.4	110.6	114.0	117.4
LGA OF BRIKAMA - Household number Urban	T	28.2	34.31	37.74	41.51	45.66	50.23	55.25	59.48	64.02	68.92	74.19	79.86	82.75	85.75	88.86	92.07	95.41	98.87	102.45	106.16	110.00	113.98
LGA OF MANSAKONKO - Household number Urban	T	2.03	2.11	2.16	2.20	2.24	2.28	2.33	2.37	2.42	2.46	2.51	2.56	2.59	2.62	2.65	2.68	2.71	2.74	2.78	2.81	2.84	2.88
LGA OF KEREWAN - Household number Urban	T	4.53	4.56	4.58	4.60	4.62	4.64	4.66	4.67	4.69	4.71	4.73	4.75	4.77	4.79	4.81	4.83	4.85	4.87	4.88	4.90	4.92	4.94
LGA OF KUNTAUR - Household number Urban	T	0.61	0.59	0.59	0.58	0.57	0.56	0.55	0.54	0.54	0.53	0.53	0.52	0.52	0.51	0.51	0.50	0.50	0.49	0.49	0.48	0.48	0.47
LGA OF GEORGETOWN - Household number Urban	T	2.13	2.43	2.60	2.78	2.97	3.18	3.40	3.63	3.88	4.14	4.43	4.73	5.00	5.28	5.57	5.88	6.21	6.56	6.92	7.31	7.72	8.15
LGA OF BASSE - Household number Urban	T	3.15	2.51	2.59	2.67	2.75	2.84	2.93	3.02	3.11	3.21	3.31	3.41	3.48	3.56	3.64	3.72	3.80	3.88	3.96	4.05	4.14	4.23
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Household number Rural	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LGA OF BRIKAMA - Household number Rural	T	16.9	16.0	15.5	15.1	14.7	14.2	13.7	13.3	12.9	12.4	11.9	11.4	11.0	10.6	10.3	9.9	9.5	9.1	8.7	8.3	7.9	7.5
LGA OF MANSAKONKO - Household number Rural	T	6.4	6.4	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.0	6.0	6.0
LGA OF KEREWAN - Household number Rural	T	13.7	14.0	14.2	14.4	14.6	14.7	14.9	15.1	15.2	15.4	15.6	15.8	15.9	15.9	16.0	16.1	16.2	16.3	16.3	16.4	16.5	16.6
LGA OF KUNTAUR - Household number Rural	T	6.5	6.6	6.7	6.7	6.8	6.8	6.9	6.9	6.9	7.0	7.0	7.0	7.0	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
LGA OF GEORGETOWN - Household number Rural	T	8.0	8.1	8.1	8.1	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.1	8.1	8.1	8.1	8.0	8.0	8.0	7.9	7.9
LGA OF BASSE - Household number Rural	T	9.4	10.4	10.4	10.5	10.5	10.5	10.6	10.6	10.6	10.6	10.6	10.6	10.7	10.7	10.7	10.7	10.7	10.7	10.8	10.8	10.8	10.8

Annex (D.1)

Fuelwood Demand Forecast (2004-2025)

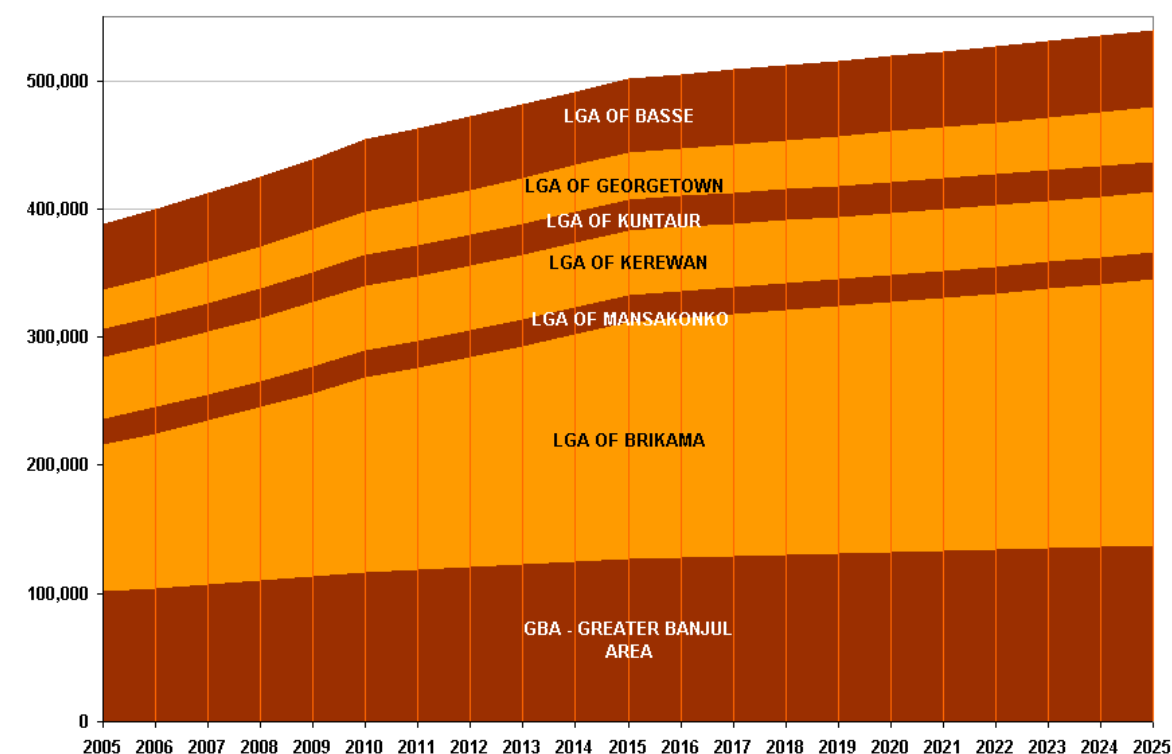
D1.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	5.0	6.0	6.0
3	Customer Prices - Annual Changes	%	14.0	7.1	7.1	7.0	7.0
4	Annual Fuelwood Consumption	TOE/a	374,890				
5	Sector Break Down - Commercial / Institutional Sector	%	3				
6	Sector Break Down - Residential Sector	%	97				
7	Specific Consumption - Residential Sector	TOE/cap	0.27				
8	Energy Intensity Index of Fuelwood Consumption	%	100	100	100	95	85
9	Regional Break Down - GBA (Urban)	%	88.6				
10	Regional Break Down - LGA OF BRIKAMA (Urban)	%	95.9				
11	Regional Break Down - LGA OF MANSAKONKO (Urban)	%	94.9				
12	Regional Break Down - LGA OF KEREWAN (Urban)	%	95.8				
13	Regional Break Down - LGA OF KUNTAUR (Urban)	%	98.0				
14	Regional Break Down - LGA OF GEORGETOWN (Urban)	%	95.8				
15	Regional Break Down - LGA OF BASSE (Urban)	%	97.2				
16	Regional Break Down - GBA (Rural)	%	0.0				
17	Regional Break Down - LGA OF BRIKAMA (Rural)	%	98.8				
18	Regional Break Down - LGA OF MANSAKONKO (Rural)	%	99.4				
19	Regional Break Down - LGA OF KEREWAN (Rural)	%	98.7				
20	Regional Break Down - LGA OF KUNTAUR (Rural)	%	99.5				
21	Regional Break Down - LGA OF GEORGETOWN (Rural)	%	99.4				
22	Regional Break Down - LGA OF BASSE (Rural)	%	99.3				

D1.2 Projection

Entire Demand																							
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	367,747	388,345	399,760	411,999	425,129	439,221	454,356	462,828	471,825	481,372	491,496	502,225	505,321	508,549	511,913	515,412	519,048	522,822	526,735	530,789	534,985	539,326
GBA - GREATER BANJUL AREA	TOE/a	95,989	101,361	104,176	107,081	110,080	113,176	116,374	118,320	120,308	122,339	124,413	126,533	127,604	128,687	129,783	130,891	132,010	133,143	134,288	135,445	136,615	137,798
LGA OF BRIKAMA	TOE/a	104,494	114,798	120,847	127,567	135,016	143,261	152,374	158,059	164,188	170,786	177,876	185,483	187,277	189,163	191,141	193,212	195,374	197,628	199,973	202,409	204,936	207,555
LGA OF MANSAKONKO	TOE/a	19,655	20,064	20,273	20,486	20,703	20,923	21,147	21,144	21,143	21,144	21,146	21,149	21,100	21,052	21,005	20,959	20,914	20,869	20,825	20,782	20,740	20,699
LGA OF KEREWAN	TOE/a	46,854	47,800	48,281	48,767	49,259	49,756	50,258	50,228	50,198	50,168	50,139	50,110	49,794	49,480	49,168	48,857	48,549	48,243	47,939	47,636	47,336	47,038
LGA OF KUNTAUR	TOE/a	21,549	22,188	22,515	22,848	23,186	23,530	23,880	23,971	24,063	24,156	24,249	24,343	24,302	24,261	24,221	24,181	24,140	24,101	24,061	24,021	23,982	23,943
LGA OF GEORGETOWN	TOE/a	29,270	30,540	31,218	31,927	32,670	33,447	34,262	34,729	35,223	35,746	36,301	36,890	37,329	37,791	38,276	38,787	39,324	39,888	40,482	41,105	41,760	42,449
LGA OF BASSE	TOE/a	49,936	51,594	52,449	53,323	54,215	55,128	56,060	56,378	56,702	57,033	57,372	57,718	57,915	58,115	58,319	58,526	58,736	58,951	59,168	59,390	59,615	59,845
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

D1.3 Graph



Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	356,470	376,436	387,499	399,360	412,082	425,737	440,401	448,612	457,329	466,579	476,387	486,781	489,784	492,915	496,177	499,571	503,096	506,755	510,549	514,480	518,548	522,755
Total Annual Demand - Urban Areas	TOE/a	173,255	191,623	201,824	212,780	224,555	237,221	250,854	260,086	269,785	279,978	290,692	301,956	306,417	310,967	315,608	320,342	325,172	330,100	335,128	340,260	345,497	350,843
Total Annual Demand - Rural Areas	TOE/a	183,215	184,812	185,675	186,580	187,527	188,516	189,547	188,526	187,544	186,601	185,695	184,825	183,366	181,948	180,569	179,228	177,924	176,655	175,421	174,220	173,051	171,912
Percentage from Total Residential Demand - Urban Areas	%	48.6	50.9	52.1	53.3	54.5	55.7	57.0	58.0	59.0	60.0	61.0	62.0	62.6	63.1	63.6	64.1	64.6	65.1	65.6	66.1	66.6	67.1
Percentage from Total Residential Demand - Rural Areas	%	51.4	49.1	47.9	46.7	45.5	44.3	43.0	42.0	41.0	40.0	39.0	38.0	37.4	36.9	36.4	35.9	35.4	34.9	34.4	33.9	33.4	32.9

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	86,899	91,762	94,295	96,897	99,572	102,320	105,144	106,881	108,646	110,441	112,265	114,120	115,114	116,118	117,130	118,151	119,181	120,220	121,269	122,326	123,392	124,468
LGA OF BRIKAMA - Annual Demand	TOE/a	103,644	113,864	119,864	126,528	133,916	142,093	151,132	156,769	162,849	169,393	176,424	183,970	185,748	187,619	189,582	191,635	193,779	196,015	198,341	200,757	203,264	205,862
LGA OF MANSAKONKO - Annual Demand	TOE/a	19,498	19,903	20,111	20,322	20,537	20,756	20,978	20,975	20,974	20,975	20,976	20,980	20,931	20,884	20,837	20,791	20,746	20,702	20,659	20,616	20,574	20,533
LGA OF KEREWAN - Annual Demand	TOE/a	46,477	47,416	47,893	48,376	48,863	49,356	49,855	49,825	49,795	49,766	49,737	49,708	49,395	49,083	48,774	48,466	48,161	47,857	47,555	47,255	46,957	46,661
LGA OF KUNTAUR - Annual Demand	TOE/a	21,378	22,012	22,337	22,667	23,002	23,344	23,691	23,781	23,872	23,964	24,057	24,150	24,110	24,069	24,029	23,989	23,950	23,910	23,871	23,831	23,792	23,753
LGA OF GEORGETOWN - Annual Demand	TOE/a	29,036	30,296	30,969	31,672	32,409	33,180	33,989	34,451	34,941	35,461	36,011	36,595	37,030	37,488	37,970	38,477	39,009	39,569	40,158	40,776	41,426	42,108
LGA OF BASSE - Annual Demand	TOE/a	49,538	51,182	52,031	52,898	53,784	54,689	55,614	55,929	56,251	56,580	56,916	57,259	57,454	57,653	57,855	58,061	58,270	58,482	58,698	58,918	59,142	59,369

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Demand Urban	TOE/a	86,899	91,762	94,295	96,897	99,572	102,320	105,144	106,881	108,646	110,441	112,265	114,120	115,114	116,118	117,130	118,151	119,181	120,220	121,269	122,326	123,392	124,468
LGA OF BRIKAMA - Demand Urban	TOE/a	61,751	73,827	80,723	88,264	96,509	105,524	115,382	122,199	129,418	137,064	145,162	153,738	156,598	159,512	162,480	165,504	168,583	171,720	174,915	178,170	181,485	184,862
LGA OF MANSAKONKO - Demand Urban	TOE/a	3,459	3,652	3,753	3,856	3,963	4,072	4,184	4,253	4,323	4,395	4,467	4,541	4,581	4,621	4,661	4,702	4,743	4,784	4,826	4,868	4,910	4,953
LGA OF KEREWAN - Demand Urban	TOE/a	9,114	9,189	9,226	9,264	9,302	9,340	9,379	9,321	9,264	9,207	9,150	9,094	9,029	8,964	8,900	8,836	8,773	8,710	8,648	8,586	8,525	8,464
LGA OF KUNTAUR - Demand Urban	TOE/a	1,353	1,337	1,329	1,321	1,313	1,305	1,297	1,284	1,270	1,257	1,245	1,232	1,218	1,205	1,192	1,178	1,165	1,152	1,140	1,127	1,115	1,102
LGA OF GEORGETOWN - Demand Urban	TOE/a	4,357	5,021	5,391	5,787	6,213	6,670	7,160	7,604	8,076	8,577	9,109	9,675	10,142	10,631	11,145	11,683	12,247	12,838	13,458	14,107	14,788	15,502
LGA OF BASSE - Demand Urban	TOE/a	6,322	6,836	7,108	7,391	7,685	7,991	8,309	8,545	8,787	9,037	9,293	9,557	9,735	9,916	10,101	10,289	10,480	10,675	10,874	11,076	11,282	11,492

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Demand Rural	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF BRIKAMA - Demand Rural	TOE/a	41,893	40,037	39,140	38,264	37,407	36,569	35,750	34,571	33,431	32,329	31,263	30,232	29,150	28,107	27,101	26,131	25,196	24,295	23,425	22,587	21,779	21,000
LGA OF MANSAKONKO - Demand Rural	TOE/a	16,039	16,251	16,358	16,466	16,575	16,684	16,794	16,722	16,651	16,580	16,509	16,439	16,351	16,263	16,176	16,090	16,004	15,918	15,833	15,748	15,664	15,580
LGA OF KEREWAN - Demand Rural	TOE/a	37,363	38,227	38,667	39,111	39,561	40,016	40,476	40,504	40,532	40,559	40,587	40,615	40,366	40,119	39,874	39,630	39,388	39,147	38,907	38,669	38,433	38,198
LGA OF KUNTAUR - Demand Rural	TOE/a	20,025	20,675	21,008	21,346	21,690	22,039	22,394	22,498	22,602	22,707	22,812	22,918	22,891	22,865	22,838	22,811	22,784	22,758	22,731	22,704	22,678	22,651
LGA OF GEORGETOWN - Demand Rural	TOE/a	24,679	25,275	25,578	25,885	26,196	26,510	26,828	26,847	26,865	26,883	26,902	26,920	26,888	26,857	26,826	26,794	26,763	26,731	26,700	26,669	26,637	26,606
LGA OF BASSE - Demand Rural	TOE/a	43,216	44,347	44,923	45,507	46,099	46,698	47,305	47,384	47,464	47,543	47,622	47,702	47,719	47,737	47,754	47,772	47,789	47,807	47,825	47,842	47,860	47,877

Commercial / Institutional Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	11,277	11,909	12,261	12,639	13,046	13,484	13,954	14,217	14,496	14,793	15,109	15,444	15,537	15,634	15,736	15,841	15,952	16,066	16,186	16,309	16,437	16,570

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	9,090	9,599	9,881	10,184	10,508	10,856	11,230	11,440	11,662	11,898	12,148	12,413	12,489	12,569	12,653	12,739	12,829	12,922	13,019	13,119	13,223	13,330
LGA OF BRIKAMA - Annual Demand	TOE/a	850	934	984	1,039	1,100	1,168	1,242	1,289	1,339	1,393	1,451	1,514	1,528	1,544	1,560	1,577	1,595	1,613	1,632	1,652	1,673	1,694
LGA OF MANSAKONKO - Annual Demand	TOE/a	157	161	162	164	166	167	169	169	169	169	169	169	169	168	168	168	167	167	166	166	166	165
LGA OF KEREWAN - Annual Demand	TOE/a	377	384	388	392	396	399	403	403	403	402	402	402	399	396	394	391	389	386	384	381	379	376
LGA OF KUNTAUR - Annual Demand	TOE/a	171	176	179	181	184	187	189	190	191	191	192	193	192	192	192	191	191	191	190	190	189	189
LGA OF GEORGETOWN - Annual Demand	TOE/a	234	244	249	255	261	267	274	277	281	286	290	295	298	302	306	310	315	319	324	329	334	340
LGA OF BASSE - Annual Demand	TOE/a	398	411	418	425	432	439	446	449	451	454	456	459	461	462	464	465	467	468	470	472	474	475

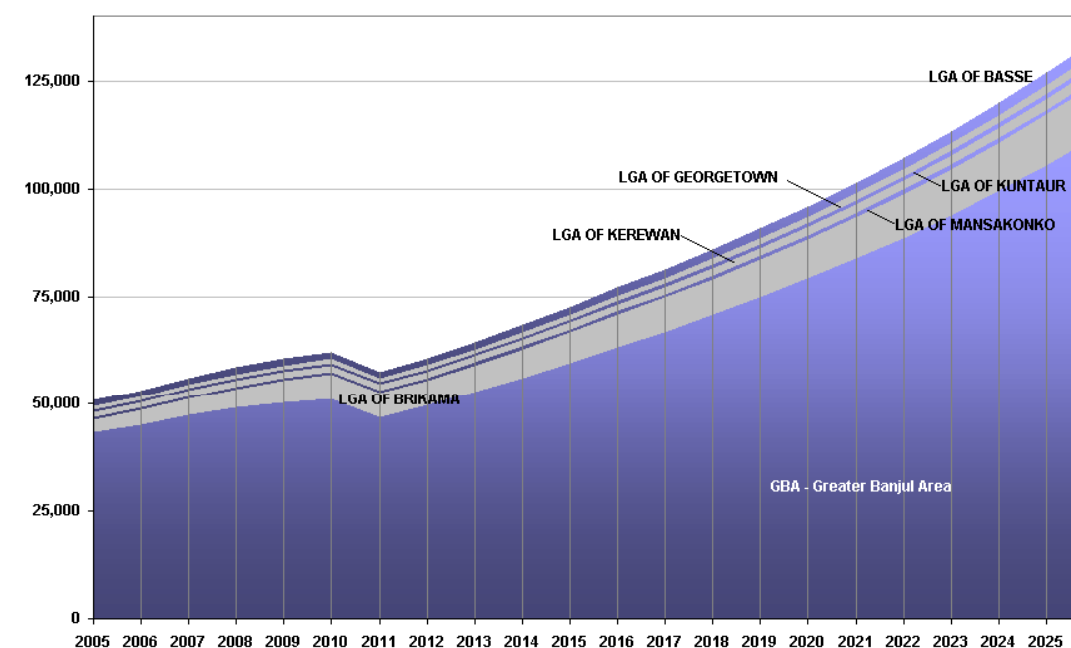
Annex (D.2)

Diesel Demand Forecast (2004-2025)

D2.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	4.6	5.0	5.0
3	Gross Domestic Product - Annual Growth in the Transport Sector	%	3.0	2.8	5.0	5.0	5.0
4	Gross Domestic Product - Annual Growth in the Service Sector	%	3.2	5.1	4.6	4.6	4.6
5	Gross Domestic Product - Annual Growth in the Industrial Sector	%	3.3	4.8	4.8	4.8	4.9
6	Gross Domestic Product - Annual Growth in the Agriculture Sector	%	29.6	3.0	4.4	4.4	4.5
7	Correlation Coefficient - Annual Growth of Energy Intensity in the Transport Sector	%	150				
8	Correlation Coefficient - Annual Growth of Energy Intensity in the Service Sector	%	164				
9	Correlation Coefficient - Annual Growth of Energy Intensity in the Agriculture Sector	%	132				
10	Correlation Coefficient - Annual Growth of Energy Intensity in the Industrial Sector	%	299				
11	Correlation Coefficient - Annual Growth of Specific Consumption in Residential Sector	%	98				
12	Total Annual Diesel Consumption	TOE/a	50,786				
13	Sector Break Down - Industrial Sector (incl. Energy Industry)	%	8				
14	Sector Break Down - Transport Sector	%	81				
15	Sector Break Down - Service Sector	%	9				
16	Sector Break Down - Agriculture Sector	%	1				
17	Sector Break Down - Residential Sector	%	1				
18	Specific Consumption - Residential Sector	TOE/cap	0.0004				
19	Annual Diesel Consumption - Energy Industry	TOE/a	1,610				
20	Annual Electricity Net Production	TOE/a	10,786				
21	Efficiency in Electricity Generation	%	38				
22	Proportion of HFO applied for Conventional Electricity Generation	%	94				
23	Proportion of Diesel applied for Conventional Electricity Generation	%	6				
24	Primary Energy Requirements for Electricity Generation at Sent-Out Level	TOE/a	10,786	13,458	31,047	32,617	32,617
25	Energy Intensity Index of Diesel Consumption	%	100	100	95	90	77

D2.3 Graph



D2.2 Projection

Entire Demand

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	50,786	53,209	56,530	59,527	62,121	64,240	60,096	64,111	68,714	73,677	79,028	84,756	90,609	97,097	104,075	111,579	119,653	128,340	137,690	147,754	158,589	170,258
GBA - Greater Banjul Area - Annual Demand	TOE/a	43,137	45,089	47,306	49,028	50,125	51,087	46,896	49,677	52,792	56,117	59,592	63,270	66,896	70,748	74,842	79,192	83,815	88,731	93,959	99,520	105,439	111,741
LGA OF BIRIKAMA - Annual Demand	TOE/a	3,039	3,410	3,847	4,434	5,290	5,830	5,654	5,911	6,300	6,725	7,173	7,644	7,960	8,345	8,754	9,188	9,649	10,138	10,657	11,208	11,794	12,417
LGA OF MANSAKONKO - Annual Demand	TOE/a	546	555	579	601	612	620	578	598	621	646	685	729	745	783	822	862	903	945	988	1,032	1,077	1,123
LGA OF KEREWAN - Annual Demand	TOE/a	1,303	1,321	1,374	1,421	1,445	1,458	1,357	1,404	1,459	1,515	1,603	1,697	1,734	1,816	1,900	1,985	2,071	2,159	2,249	2,341	2,434	2,530
LGA OF KUNTAUR - Annual Demand	TOE/a	583	592	613	628	635	635	593	619	646	674	706	740	772	811	852	894	938	984	1,031	1,081	1,132	1,186
LGA OF GEORGETOWN - Annual Demand	TOE/a	803	830	870	905	928	942	889	934	985	1,038	1,107	1,182	1,240	1,321	1,406	1,497	1,593	1,696	1,805	1,921	2,045	2,177
LGA OF BASSE - Annual Demand	TOE/a	1,375	1,411	1,475	1,533	1,567	1,588	1,488	1,549	1,619	1,692	1,797	1,910	1,974	2,085	2,201	2,320	2,443	2,572	2,705	2,843	2,986	3,135

All Sectors - Break Down

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Break Down - Transport Sector	%	81.1	80.7	80.8	80.8	80.7	80.5	87.9	88.6	88.8	89.1	89.3	89.5	90.0	90.3	90.5	90.8	91.0	91.2	91.4	91.5	91.7	91.8
Break Down - Service Sector	%	9.0	9.3	9.4	9.6	9.9	10.3	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Break Down - Energy Industry	%	3.2	4.0	4.7	5.6	6.6	8.0	8.2	7.4	7.2	6.9	6.7	6.4	5.9	5.5	5.2	4.9	4.6	4.3	4.0	3.7	3.5	3.2
Break Down - Industry	%	5.0	5.5	5.9	6.4	7.0	7.8	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Break Down - Agriculture Sector	%	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Break Down - Residential Sector	%	1.0	1.0	0.9	0.9	0.9	0.9	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5	0.5

Transport Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	41,187	42,917	45,199	47,116	48,614	49,647	50,184	53,368	56,753	60,354	64,182	68,254	72,237	76,453	80,915	85,637	90,635	95,924	101,522	107,447	113,718	120,354
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	35,009	36,480	38,419	40,049	41,322	42,200	42,657	45,363	48,240	51,301	54,555	58,016	61,402	64,985	68,778	72,792	77,040	81,536	86,294	91,330	96,660	102,301
LGA OF BRIKAMA - Annual Demand	TOE/a	2,400.1	2,603.3	2,802.8	2,990.3	3,161.0	3,310.1	3,433.2	3,715.6	4,022.7	4,356.6	4,719.3	5,113.0	5,434.5	5,776.8	6,141.2	6,529.1	6,941.9	7,381.3	7,848.8	8,346.1	8,875.2	9,437.9
LGA OF MANSAKONKO - Annual Demand	TOE/a	444.6	447.5	462.2	471.8	475.9	474.4	467.4	487.4	507.9	528.6	549.7	571.1	599.8	629.7	661.0	693.6	727.7	763.2	800.3	839.0	879.4	921.5
LGA OF KEREWAN - Annual Demand	TOE/a	1,064.7	1,070.7	1,105.3	1,127.5	1,136.6	1,132.3	1,114.6	1,161.6	1,209.4	1,257.8	1,306.9	1,356.5	1,418.7	1,483.3	1,550.4	1,620.0	1,692.3	1,767.4	1,845.2	1,926.0	2,009.8	2,096.6
LGA OF KUNTAUR - Annual Demand	TOE/a	483.5	490.8	509.0	521.6	528.3	528.8	523.0	547.5	572.5	598.1	624.2	650.8	683.8	718.3	754.3	791.8	831.1	872.0	914.6	959.2	1,005.6	1,053.9
LGA OF GEORGETOWN - Annual Demand	TOE/a	660.5	679.7	710.3	734.0	749.8	757.4	756.4	799.8	845.4	893.3	943.5	996.2	1,061.3	1,130.9	1,205.3	1,284.9	1,370.0	1,461.0	1,558.5	1,662.9	1,774.8	1,894.8
LGA OF BASSE - Annual Demand	TOE/a	1,124.7	1,145.6	1,190.3	1,222.3	1,240.4	1,244.1	1,233.0	1,293.2	1,355.1	1,418.6	1,483.8	1,550.4	1,637.5	1,728.9	1,825.1	1,926.1	2,032.2	2,143.8	2,260.9	2,383.8	2,512.9	2,648.5

Industrial Sector (Energy Industry only)

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	1,610	2,125	2,651	3,308	4,128	5,150	4,902	4,776	4,922	5,089	5,277	5,449	5,321	5,369	5,413	5,451	5,484	5,509	5,528	5,538	5,540	5,532
Total Electricity Demand at Sent-Out Level (including Suppressed Demand)	TOE/a	24,861	27,939	31,453	35,465	40,047	45,280	51,257	51,919	54,306	56,824	59,478	62,278	63,286	65,535	67,880	70,327	72,881	75,546	78,330	81,238	84,277	87,453
Electricity Demand to be covered by Primary Energy Transformation	TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	31,047	30,247	31,172	32,228	33,420	34,511	33,697	34,005	34,282	34,525	34,730	34,893	35,010	35,076	35,087	35,036
Diesel Demand of Energy Industry	TOE/a	1,610	2,125	2,651	3,308	4,128	5,150	4,902	4,776	4,922	5,089	5,277	5,449	5,321	5,369	5,413	5,451	5,484	5,509	5,528	5,538	5,540	5,532
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	1,368	1,702	1,953	2,142	2,222	2,772	2,639	2,571	2,649	2,739	2,766	2,767	2,765	2,765	2,766	2,767	2,769	2,770	2,771	2,772	2,772	2,771
LGA OF BRIKAMA - Annual Demand	TOE/a	161.0	297.3	515.3	898.6	1,575.0	1,965.2	1,870.6	1,822.4	1,878.1	1,941.7	1,996.0	2,040.2	2,007.0	2,019.4	2,030.7	2,040.8	2,049.3	2,056.2	2,061.2	2,064.0	2,064.4	2,062.3
LGA OF MANSAKONKO - Annual Demand	TOE/a	12.9	20.0	29.2	42.9	52.9	66.0	62.8	61.2	63.1	65.2	82.4	102.6	87.7	93.5	98.5	102.9	106.5	109.3	111.3	112.4	112.6	111.7
LGA OF KEREWAN - Annual Demand	TOE/a	26.4	41.1	60.0	88.0	108.6	135.5	129.0	125.7	129.5	133.9	169.1	210.7	180.1	191.9	202.3	211.2	218.6	224.4	228.5	230.8	231.2	229.4
LGA OF KUNTAUR - Annual Demand	TOE/a	3.4	5.3	7.7	11.3	14.0	17.4	16.6	16.2	16.7	17.2	21.7	27.1	23.2	24.7	26.0	27.2	28.1	28.9	29.4	29.7	29.7	29.5
LGA OF GEORGETOWN - Annual Demand	TOE/a	11.3	17.6	25.7	37.7	46.6	58.1	55.3	53.9	55.5	57.4	72.5	90.3	77.2	82.3	86.7	90.6	93.7	96.2	98.0	99.0	99.1	98.4
LGA OF BASSE - Annual Demand	TOE/a	26.5	41.1	60.0	88.1	108.7	135.6	129.1	125.8	129.6	134.0	169.2	210.8	180.2	192.0	202.4	211.3	218.7	224.5	228.6	231.0	231.3	229.6

Industrial Sector (Remaining)

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	2,554	2,699	2,809	2,867	2,848	2,720	571	653	747	854	977	1,117	1,277	1,460	1,670	1,910	2,184	2,497	2,856	3,265	3,734	4,270
Annual Diesel Demand (Substitution of Self-Generation by 100%-Electricity Supply)	TOE/a	2,554	2,699	2,809	2,867	2,848	2,720	571	653	747	854	977	1,117	1,277	1,460	1,670	1,910	2,184	2,497	2,856	3,265	3,734	4,270
Diesel Demand of Other Industry (incl. Requirements for Electricity Self-Generation)	TOE/a	2,554	2,921	3,340	3,820	4,368	4,995	5,712															
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	2,299	2,429	2,528	2,580	2,563	2,448	514	588	672	769	879	1,005	1,149	1,314	1,503	1,719	1,965	2,247	2,570	2,939	3,361	3,843
LGA OF BRIKAMA - Annual Demand	TOE/a	99	109	116	121	123	121	26	30	35	41	48	56	64	74	84	97	112	128	147	169	194	223
LGA OF MANSAKONKO - Annual Demand	TOE/a	18	19	19	19	19	17	4	4	4	5	6	6	7	8	9	10	12	13	15	17	19	22
LGA OF KEREWAN - Annual Demand	TOE/a	44	45	46	46	44	41	8	9	11	12	13	15	17	19	21	24	27	31	35	39	44	50
LGA OF KUNTAUR - Annual Demand	TOE/a	20	21	21	21	21	19	4	4	5	6	6	7	8	9	10	12	13	15	17	19	22	25
LGA OF GEORGETOWN - Annual Demand	TOE/a	27	28	29	30	29	28	6	7	7	8	10	11	13	14	17	19	22	25	29	34	39	45
LGA OF BASSE - Annual Demand	TOE/a	47	48	49	50	48	45	9	11	12	13	15	17	19	22	25	29	33	37	42	48	55	63

Commercial / Institutional Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	4,571	4,577	4,478	4,295	4,010	3,599	710	764	822	884	951	1,023	1,100	1,183	1,272	1,369	1,472	1,583	1,703	1,832	1,970	2,119
Total Annual Diesel Demand	TOE/a	4,571	4,577	4,478	4,295	4,010	3,599	710	764	822	884	951	1,023	1,100	1,183	1,272	1,369	1,472	1,583	1,703	1,832	1,970	2,119
Diesel Demand (incl. Requirements for Electricity Self-Generation)	TOE/a	4,571	4,954	5,324	5,722	6,150	6,610	7,104															
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	4,114	4,119	4,030	3,865	3,609	3,239	639	688	740	796	856	920	990	1,065	1,145	1,232	1,325	1,425	1,533	1,648	1,773	1,907
LGA OF BRIKAMA - Annual Demand	TOE/a	178	185	185	182	174	160	32	35	39	43	47	51	55	60	64	70	75	81	88	95	103	111
LGA OF MANSAKONKO - Annual Demand	TOE/a	33	32	31	29	26	23	4	5	5	5	5	6	6	6	7	7	8	8	9	10	10	11
LGA OF KEREWAN - Annual Demand	TOE/a	79	76	73	69	62	55	11	11	12	12	13	14	14	15	16	17	18	19	21	22	23	25
LGA OF KUNTAUR - Annual Demand	TOE/a	36	35	34	32	29	26	5	5	6	6	6	7	7	7	8	8	9	10	10	11	12	12
LGA OF GEORGETOWN - Annual Demand	TOE/a	49	48	47	45	41	37	7	8	8	9	9	10	11	12	13	14	15	16	17	19	20	22
LGA OF BASSE - Annual Demand	TOE/a	83	81	79	74	68	60	12	12	13	14	15	15	17	18	19	21	22	24	25	27	29	31

Agriculture Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	356	370	391	414	438	463	490	519	549	581	615	650	689	730	773	819	868	920	974	1,032	1,093	1,158
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	213	222	235	248	263	278	294	311	329	348	369	390	413	438	464	492	521	552	585	619	656	695
LGA OF BRIKAMA - Annual Demand	TOE/a	55	60	65	70	76	82	89	96	104	112	120	130	138	147	157	167	177	189	201	214	228	242
LGA OF MANSAKONKO - Annual Demand	TOE/a	10	10	11	11	11	12	12	13	13	14	14	15	15	16	17	18	19	20	20	21	23	24
LGA OF KEREWAN - Annual Demand	TOE/a	25	25	26	26	27	28	29	30	31	32	33	34	36	38	40	41	43	45	47	49	52	54
LGA OF KUNTAUR - Annual Demand	TOE/a	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	20	21	22	23	25	26	27
LGA OF GEORGETOWN - Annual Demand	TOE/a	15	16	16	17	18	19	20	21	22	23	24	25	27	29	31	33	35	37	40	43	46	49
LGA OF BASSE - Annual Demand	TOE/a	26	26	27	29	30	31	32	34	35	36	38	39	42	44	47	49	52	55	58	61	64	68

Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	508	522	536	550	565	581	596	612	628	645	662	680	697	715	733	752	771	790	810	831	852	874
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	134	137	140	144	147	150	153	157	161	164	168	171	176	181	186	191	196	201	207	212	218	223
LGA OF BRIKAMA - Annual Demand	TOE/a	145	156	163	172	181	191	202	211	221	231	242	254	261	269	277	285	293	302	311	321	330	340
LGA OF MANSAKONKO - Annual Demand	TOE/a	27	27	27	27	27	27	28	28	28	28	28	28	29	29	30	30	31	31	32	32	33	33
LGA OF KEREWAN - Annual Demand	TOE/a	65	64	64	65	65	65	66	66	66	67	67	67	68	69	70	71	72	72	73	74	75	76
LGA OF KUNTAUR - Annual Demand	TOE/a	29	29	30	30	30	31	31	31	31	32	32	32	33	33	34	35	35	36	36	37	37	38
LGA OF GEORGETOWN - Annual Demand	TOE/a	40	41	41	42	43	44	45	45	46	47	48	49	51	53	54	56	58	60	62	64	66	68
LGA OF BASSE - Annual Demand	TOE/a	68	68	69	70	71	72	73	74	74	75	76	77	79	80	82	84	86	88	90	92	93	95

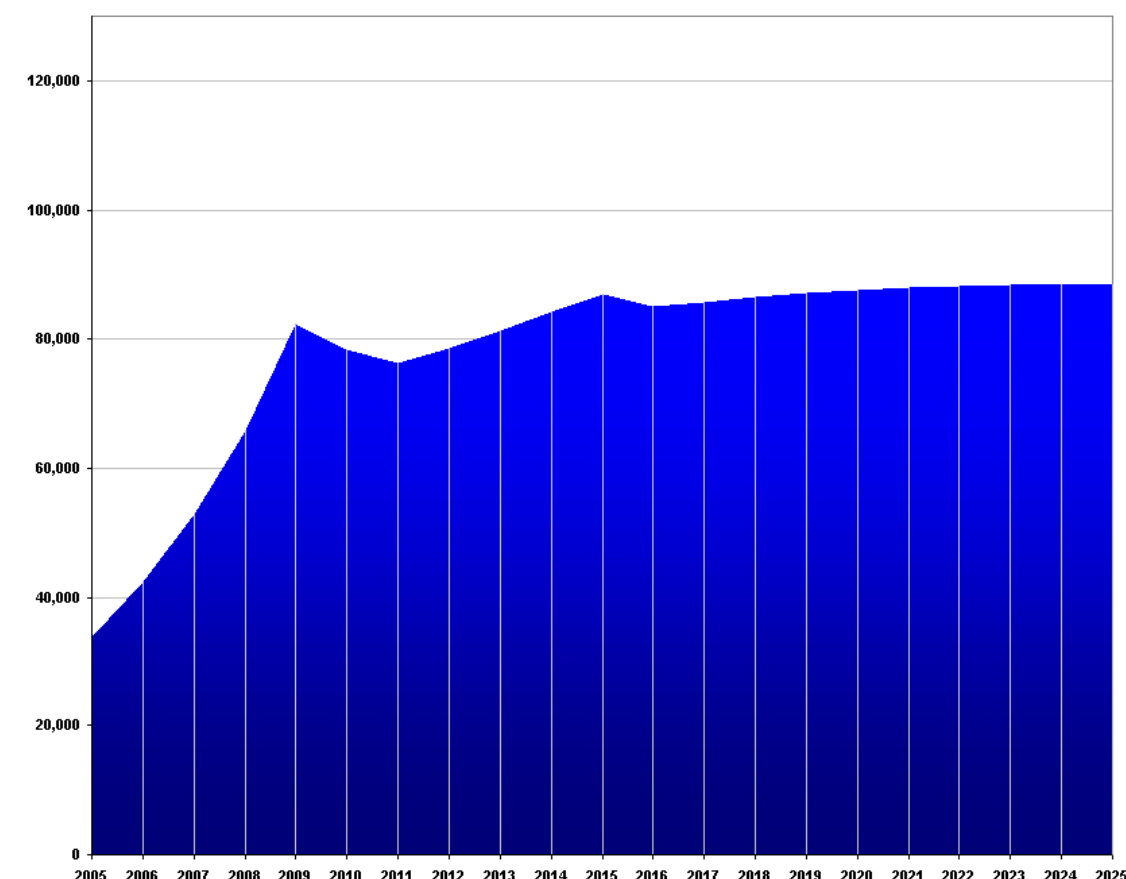
Annex (D.3)

HFO Demand Forecast (2004-2025)

D2.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	4.6	5.0	5.0
3	Annual HFO Consumption - Energy Industry	TOE/a	26,070				
4	Sector Break Down - Energy Industry	%	98				
5	Sector Break Down - Other Industry	%	2				
6	Annual Electricity Net Production	TOE/a	10,786				
7	Efficiency in Electricity Generation	%	38				
8	Proportion of HFO applied for Conventional Electricity Generation	%	94				
9	Proportion of Diesel applied for Conventional Electricity Generation	%	6				
10	Primary Energy Requirements for Electricity Generation at Sent-Out Level	TOE/a	10,786	13,458	31,047	32,617	32,617

D2.3 Graph



D2.2 Projection

Entire Demand																								
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	
Total Annual Demand	TOE/a	26,580	33,942	42,350	52,842	65,932	82,265	78,305	76,287	78,620	81,282	84,290	87,040	84,988	85,764	86,463	87,076	87,593	88,004	88,299	88,467	88,493	88,366	
Total Electricity Demand at Sent-Out Level (including Suppressed Demand)		TOE/a	24,861	27,939	31,453	35,465	40,047	45,280	51,257	51,919	54,306	56,824	59,478	62,278	63,286	65,535	67,880	70,327	72,881	75,546	78,330	81,238	84,277	87,453
Electricity Demand to be covered by Primary Energy Transformation		TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	31,047	30,247	31,172	32,228	33,420	34,511	33,697	34,005	34,282	34,525	34,730	34,893	35,010	35,076	35,087	35,036
HFO Demand of Energy Industry		TOE/a	26,070	33,290	41,537	51,827	64,666	80,685	76,801	74,822	77,110	79,721	82,672	85,369	83,357	84,118	84,803	85,404	85,911	86,314	86,604	86,768	86,794	86,669
HFO Demand of Other Industry		TOE/a	510	652	813	1,015	1,266	1,579	1,503	1,465	1,509	1,561	1,618	1,671	1,632	1,647	1,660	1,672	1,682	1,690	1,695	1,699	1,699	1,697

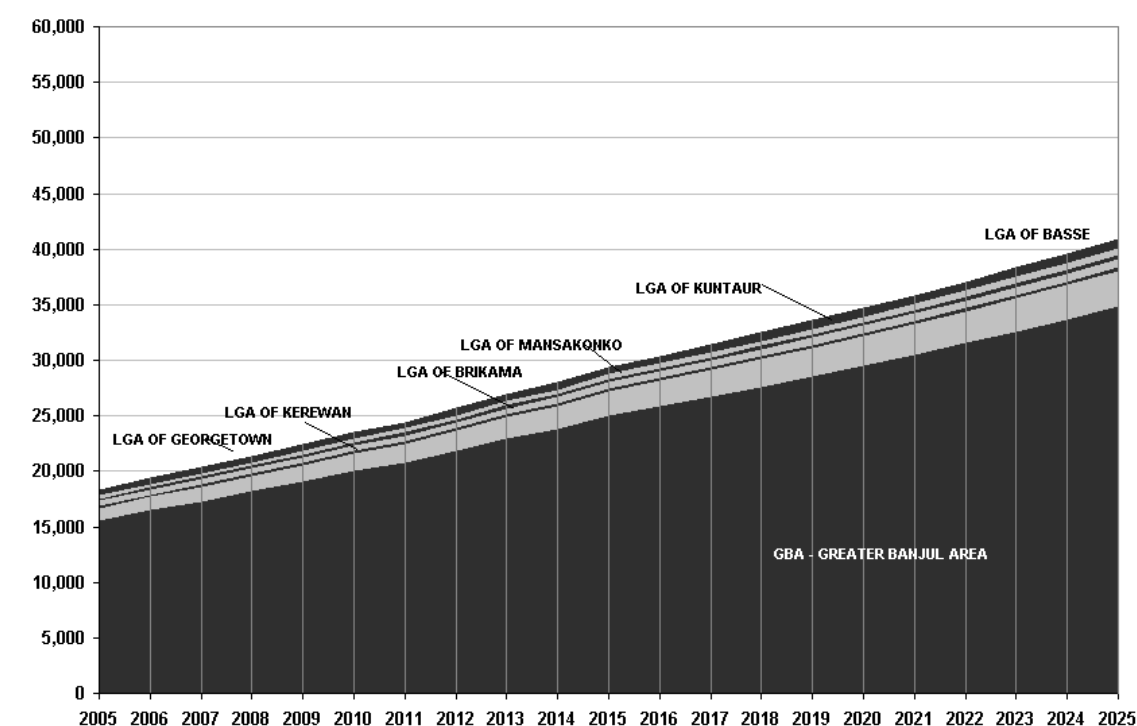
Annex (D.4)

Gasoline Demand Forecast (2004-2025)

D4.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	4.6	5.0	5.0
3	Customer Prices - Annual Changes	%	14.0	7.1	7.1	7.0	7.0
4	Gross Domestic Product - Annual Growth in the Transport Sector	%	3.0	2.8	5.0	5.0	5.0
5	Correlation Coefficient - Annual Growth of Energy Intensity in the Transport Sector	%	136.6				
6	Annual Gasoline Consumption	TOE/a	18,600				
7	Sector Break Down - Agriculture / Fishing	%	0.3				
8	Sector Break Down - Transport	%	94.7				
9	Sector Break Down - Commercial Institutional	%	0.7				
10	Sector Break Down - Residential Sector	%	0.2				
11	Specific Consumption - Residential Sector	TOE/cap	0.00003				
12	Energy Intensity Index of Gasoline Consumption	%	100	100	95	90	77

D4.3 Graph



D4.2 Projection

Entire Demand																									
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		
Total Annual Demand	TOE/a	17,651	18,326	19,383	20,352	21,368	22,436	23,557	24,468	25,691	26,974	28,018	29,418	30,409	31,433	32,493	33,587	34,719	35,889	37,099	38,349	39,642	40,978		
GBA - GREATER BANJUL AREA	TOE/a	15,004	15,577	16,476	17,299	18,163	19,071	20,024	20,798	21,837	22,928	23,815	25,005	25,847	26,718	27,619	28,549	29,511	30,506	31,534	32,597	33,696	34,831		
LGA OF BRIKAMA	TOE/a	1,029	1,112	1,202	1,292	1,389	1,496	1,612	1,704	1,821	1,947	2,060	2,204	2,288	2,375	2,466	2,561	2,659	2,762	2,868	2,979	3,094	3,213		
LGA OF MANSAKONKO	TOE/a	191	191	198	204	209	214	219	223	230	236	240	246	252	259	265	272	279	286	292	299	307	314		
LGA OF KEREWAN	TOE/a	456	457	474	487	500	512	523	533	547	562	571	585	597	610	623	635	648	661	674	687	701	714		
LGA OF KUNTAUR	TOE/a	207	210	218	225	232	239	245	251	259	267	272	281	288	295	303	311	318	326	334	342	351	359		
LGA OF GEORGETOWN	TOE/a	283	290	305	317	330	342	355	367	383	399	412	429	447	465	484	504	525	547	570	594	619	645		
LGA OF BASSE	TOE/a	482	489	510	528	545	562	579	593	613	634	648	668	689	711	733	755	778	802	826	851	876	902		
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		

Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Gasoline Demand	TOE/a	37.2	38.3	39.4	40.6	41.9	43.3	44.8	45.7	47.0	48.5	49.5	51.1	51.2	51.3	51.4	51.6	51.7	51.9	52.0	52.2	52.4	52.6
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	31.6	32.5	33.5	34.5	35.6	36.8	38.1	38.8	40.0	41.2	42.1	43.5	43.5	43.6	43.7	43.8	44.0	44.1	44.2	44.4	44.5	44.7
LGA OF BRIKAMA - Annual Demand	TOE/a	2.2	2.3	2.4	2.6	2.7	2.9	3.1	3.2	3.3	3.5	3.6	3.8	3.9	3.9	3.9	3.9	4.0	4.0	4.0	4.1	4.1	4.1
LGA OF MANSAKONKO - Annual Demand	TOE/a	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
LGA OF KEREWAN - Annual Demand	TOE/a	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.9	0.9
LGA OF KUNTAUR - Annual Demand	TOE/a	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
LGA OF GEORGETOWN - Annual Demand	TOE/a	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
LGA OF BASSE - Annual Demand	TOE/a	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2

Transport / Aviation Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Gasoline Demand	TOE/a	17,614	18,288	19,344	20,311	21,327	22,393	23,512	24,423	25,644	26,926	27,968	29,367	30,358	31,382	32,441	33,536	34,668	35,837	37,047	38,297	39,589	40,925
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	14,972	15,545	16,442	17,264	18,128	19,034	19,986	20,759	21,797	22,887	23,773	24,962	25,804	26,675	27,575	28,505	29,467	30,462	31,490	32,553	33,651	34,787
LGA OF BRIKAMA - Annual Demand	TOE/a	1,026	1,109	1,200	1,289	1,387	1,493	1,609	1,700	1,818	1,944	2,056	2,200	2,284	2,371	2,462	2,557	2,655	2,758	2,864	2,975	3,090	3,209
LGA OF MANSAKONKO - Annual Demand	TOE/a	190	191	198	203	209	214	219	223	229	236	240	246	252	258	265	272	278	285	292	299	306	313
LGA OF KEREWAN - Annual Demand	TOE/a	455	456	473	486	499	511	522	532	546	561	569	584	596	609	622	634	647	660	673	686	700	713
LGA OF KUNTAUR - Annual Demand	TOE/a	207	209	218	225	232	239	245	251	259	267	272	280	287	295	302	310	318	326	334	342	350	358
LGA OF GEORGETOWN - Annual Demand	TOE/a	282	290	304	316	329	342	354	366	382	399	411	429	446	464	483	503	524	546	569	593	618	644
LGA OF BASSE - Annual Demand	TOE/a	481	488	509	527	544	561	578	592	612	633	647	667	688	710	732	754	777	801	825	850	875	901

Commercial / Institutional Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Gasoline Demand	TOE/a	130.2	133.9	137.9	142.2	146.8	151.7	156.9	159.8	164.7	169.8	173.3	178.9	179.2	179.6	180.0	180.5	181.0	181.5	182.1	182.7	183.4	184.1
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	110.7	113.9	117.2	120.9	124.8	128.9	133.4	135.8	140.0	144.3	147.3	152.1	152.4	152.7	153.0	153.4	153.8	154.3	154.8	155.3	155.9	156.5
LGA OF BRIKAMA - Annual Demand	TOE/a	7.6	8.1	8.6	9.0	9.5	10.1	10.7	11.1	11.7	12.3	12.7	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4
LGA OF MANSAKONKO - Annual Demand	TOE/a	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4
LGA OF KEREWAN - Annual Demand	TOE/a	3.4	3.3	3.4	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.5	3.5	3.4	3.4	3.4	3.3	3.3	3.3	3.2	3.2
LGA OF KUNTAUR - Annual Demand	TOE/a	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.6	1.6	1.6	1.6
LGA OF GEORGETOWN - Annual Demand	TOE/a	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.9	2.9
LGA OF BASSE - Annual Demand	TOE/a	3.6	3.6	3.6	3.7	3.7	3.8	3.9	3.9	3.9	4.0	4.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1

Agriculture / Fishing

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Gasoline Demand	TOE/a	55.8	57.4	59.1	60.9	62.9	65.0	67.3	68.5	70.6	72.8	74.3	76.7	76.8	77.0	77.2	77.4	77.6	77.8	78.0	78.3	78.6	78.9
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	33.5	34.4	35	37	38	39	40	41	42	44	45	46	46	46	46	46	47	47	47	47	47	47
LGA OF BRIKAMA - Annual Demand	TOE/a	8.7	9.3	10	10	11	12	12	13	13	14	15	15	15	16	16	16	16	16	16	16	16	16
LGA OF MANSAKONKO - Annual Demand	TOE/a	1.6	1.6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LGA OF KEREWAN - Annual Demand	TOE/a	3.8	3.8	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
LGA OF KUNTAUR - Annual Demand	TOE/a	1.7	1.8	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LGA OF GEORGETOWN - Annual Demand	TOE/a	2.4	2.4	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LGA OF BASSE - Annual Demand	TOE/a	4.1	4.1	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5

Annex (D.5)

Kerosene and Jet Demand Forecast (2004-2025)

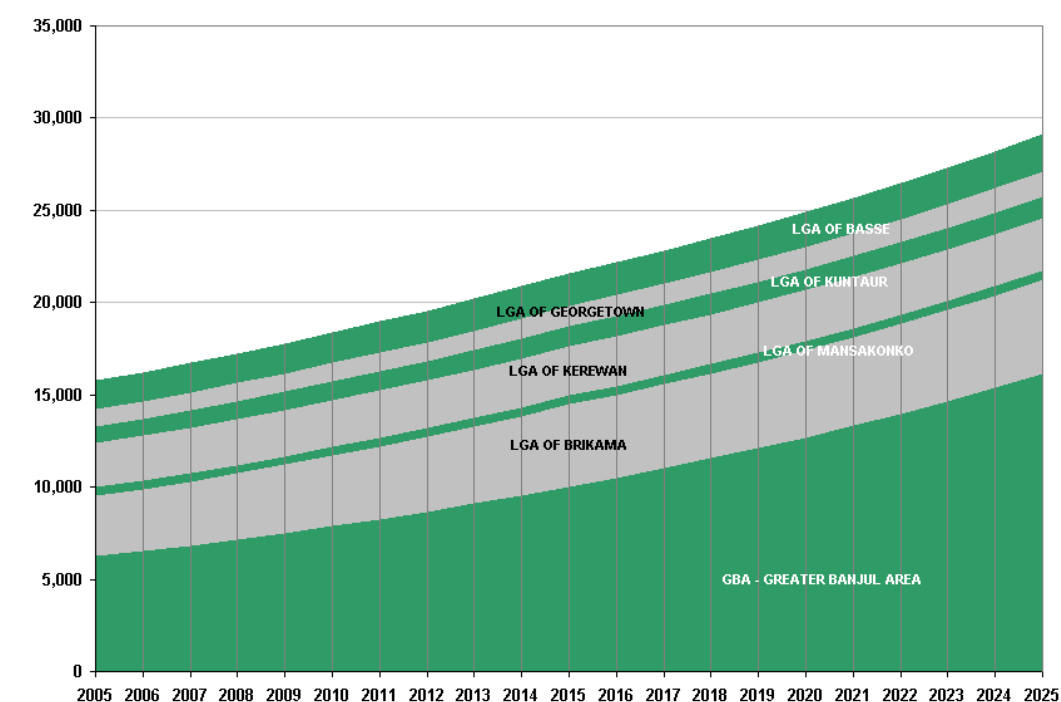
D5.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	4.6	5.0	5.0
3	Customer Prices - Annual Changes	%	14.0	7.1	7.1	7.0	7.0
4	Gross Domestic Product - Annual Growth in Transport Sector	%	3.0	2.8	5.0	5.0	5.0
5	Correlation Coefficient - Annual Growth of Energy Intensity in Transport Sector	%	79.4				
6	Annual Kerosene / Jet Consumption	TOE/a	15,350				
7	Sector Break Down - Transport and Aviation	%	38				
8	Sector Break Down - Residential Sector	%	62				
9	Specific Consumption - Residential Sector	TOE/cap	0.03				
10	Energy Intensity Index of Kerosene Consumption	%	100	100	100	100	100
11	Regional Break Down - GBA (Urban)	%	3.5				
12	Regional Break Down - LGA OF BRIKAMA (Urban)	%	18.3				
13	Regional Break Down - LGA OF MANSAKONKO (Urban)	%	14.2				
14	Regional Break Down - LGA OF KEREWAN (Urban)	%	15.3				
15	Regional Break Down - LGA OF KUNTAUR (Urban)	%	17.7				
16	Regional Break Down - LGA OF GEORGETOWN (Urban)	%	16.0				
17	Regional Break Down - LGA OF BASSE (Urban)	%	16.0				
18	Regional Break Down - GBA (Rural)	%	0.0				
19	Regional Break Down - LGA OF BRIKAMA (Rural)	%	52.6				
20	Regional Break Down - LGA OF MANSAKONKO (Rural)	%	25.3				
21	Regional Break Down - LGA OF KEREWAN (Rural)	%	62.7				
22	Regional Break Down - LGA OF KUNTAUR (Rural)	%	46.3				
23	Regional Break Down - LGA OF GEORGETOWN (Rural)	%	36.2				
24	Regional Break Down - LGA OF BASSE (Rural)	%	34.5				

D5.2 Projection

Entire Demand																							
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	15,350	15,783	16,223	16,717	17,242	17,800	18,393	18,968	19,576	20,216	20,892	21,605	22,209	22,843	23,506	24,201	24,929	25,692	26,490	27,327	28,202	29,119
GBA - GREATER BANJUL AREA	TOE/a	6,090	6,236	6,514	6,832	7,165	7,515	7,883	8,268	8,672	9,096	9,542	10,009	10,496	11,007	11,544	12,107	12,698	13,318	13,969	14,652	15,370	16,122
LGA OF BRIKAMA	TOE/a	3,181	3,305	3,383	3,474	3,578	3,698	3,833	3,936	4,050	4,176	4,314	4,466	4,513	4,564	4,618	4,676	4,738	4,803	4,873	4,946	5,023	5,105
LGA OF MANSAKONKO	TOE/a	430	438	442	446	450	454	458	462	466	470	474	478	482	486	490	494	497	501	505	509	513	518
LGA OF KEREWAN	TOE/a	2,351	2,403	2,430	2,457	2,484	2,512	2,539	2,566	2,594	2,621	2,649	2,677	2,691	2,704	2,717	2,731	2,744	2,758	2,771	2,785	2,799	2,813
LGA OF KUNTAUR	TOE/a	893	921	936	950	965	980	995	1,010	1,025	1,040	1,055	1,071	1,081	1,092	1,102	1,113	1,124	1,135	1,146	1,157	1,169	1,180
LGA OF GEORGETOWN	TOE/a	906	937	953	970	987	1,005	1,023	1,041	1,060	1,080	1,100	1,122	1,141	1,161	1,181	1,202	1,224	1,247	1,271	1,296	1,321	1,348
LGA OF BASSE	TOE/a	1,498	1,543	1,566	1,589	1,613	1,637	1,661	1,685	1,709	1,733	1,757	1,783	1,806	1,830	1,854	1,878	1,903	1,929	1,954	1,980	2,007	2,034
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

D5.3 Graph



Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	9,580	9,884	10,056	10,242	10,443	10,661	10,897	11,098	11,311	11,539	11,781	12,038	12,164	12,295	12,431	12,572	12,719	12,871	13,029	13,192	13,361	13,536
Total Annual Demand - Urban Areas	TOE/a	1,793	2,048	2,192	2,349	2,518	2,703	2,904	3,074	3,254	3,447	3,653	3,872	3,984	4,099	4,218	4,340	4,466	4,596	4,731	4,870	5,013	5,161
Total Annual Demand - Rural Areas	TOE/a	7,787	7,836	7,864	7,893	7,925	7,958	7,993	8,024	8,057	8,091	8,128	8,166	8,180	8,196	8,214	8,233	8,253	8,274	8,298	8,322	8,348	8,375
Percentage from Total Residential Demand - Urban Areas	%	18.7	20.7	21.8	22.9	24.1	25.4	26.6	27.7	28.8	29.9	31.0	32.2	32.8	33.3	33.9	34.5	35.1	35.7	36.3	36.9	37.5	38.1
Percentage from Total Residential Demand - Rural Areas	%	81.3	79.3	78.2	77.1	75.9	74.6	73.4	72.3	71.2	70.1	69.0	67.8	67.2	66.7	66.1	65.5	64.9	64.3	63.7	63.1	62.5	61.9
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	320	338	347	356	366	376	387	397	408	419	430	442	451	460	469	478	488	498	508	518	528	539
LGA OF BRIKAMA - Annual Demand	TOE/a	3,181	3,305	3,383	3,474	3,578	3,698	3,833	3,936	4,050	4,176	4,314	4,466	4,513	4,564	4,618	4,676	4,738	4,803	4,873	4,946	5,023	5,105
LGA OF MANSAKONKO - Annual Demand	TOE/a	430	438	442	446	450	454	458	462	466	470	474	478	482	486	490	494	497	501	505	509	513	518
LGA OF KEREWAN - Annual Demand	TOE/a	2,351	2,403	2,430	2,457	2,484	2,512	2,539	2,566	2,594	2,621	2,649	2,677	2,691	2,704	2,717	2,731	2,744	2,758	2,771	2,785	2,799	2,813
LGA OF KUNTAUR - Annual Demand	TOE/a	893	921	936	950	965	980	995	1,010	1,025	1,040	1,055	1,071	1,081	1,092	1,102	1,113	1,124	1,135	1,146	1,157	1,169	1,180
LGA OF GEORGETOWN - Annual Demand	TOE/a	906	937	953	970	987	1,005	1,023	1,041	1,060	1,080	1,100	1,122	1,141	1,161	1,181	1,202	1,224	1,247	1,271	1,296	1,321	1,348
LGA OF BASSE - Annual Demand	TOE/a	1,498	1,543	1,566	1,589	1,613	1,637	1,661	1,685	1,709	1,733	1,757	1,783	1,806	1,830	1,854	1,878	1,903	1,929	1,954	1,980	2,007	2,034
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Demand Urban	TOE/a	320	338	347	356	366	376	387	397	408	419	430	442	451	460	469	478	488	498	508	518	528	539
LGA OF BRIKAMA - Demand Urban	TOE/a	1,101	1,316	1,439	1,574	1,721	1,882	2,057	2,201	2,355	2,520	2,697	2,886	2,972	3,061	3,153	3,248	3,345	3,446	3,549	3,655	3,765	3,878
LGA OF MANSAKONKO - Demand Urban	TOE/a	48	51	52	54	55	57	58	60	62	63	65	67	68	69	71	72	74	75	77	78	80	81
LGA OF KEREWAN - Demand Urban	TOE/a	136	137	138	138	139	139	140	141	141	142	142	143	143	144	145	145	146	146	147	147	148	149
LGA OF KUNTAUR - Demand Urban	TOE/a	23	23	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
LGA OF GEORGETOWN - Demand Urban	TOE/a	68	78	84	90	97	104	112	120	129	138	148	159	168	179	189	201	213	225	239	253	269	285
LGA OF BASSE - Demand Urban	TOE/a	97	105	109	114	118	123	128	133	138	143	149	155	159	164	169	174	179	185	190	196	202	208
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Demand Rural	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF BRIKAMA - Demand Rural	TOE/a	2,080	1,988	1,944	1,900	1,858	1,816	1,775	1,734	1,695	1,656	1,617	1,580	1,541	1,502	1,465	1,428	1,392	1,358	1,324	1,291	1,258	1,227
LGA OF MANSAKONKO - Demand Rural	TOE/a	382	387	389	392	394	397	400	402	404	407	409	412	414	417	419	421	424	426	429	431	434	436
LGA OF KEREWAN - Demand Rural	TOE/a	2,215	2,266	2,292	2,319	2,345	2,372	2,399	2,426	2,453	2,480	2,507	2,534	2,547	2,560	2,573	2,585	2,598	2,611	2,624	2,638	2,651	2,664
LGA OF KUNTAUR - Demand Rural	TOE/a	870	899	913	928	943	958	973	988	1,003	1,018	1,033	1,049	1,059	1,070	1,080	1,091	1,102	1,113	1,124	1,136	1,147	1,158
LGA OF GEORGETOWN - Demand Rural	TOE/a	838	859	869	879	890	901	911	921	932	942	952	963	972	982	992	1,002	1,012	1,022	1,032	1,042	1,053	1,063
LGA OF BASSE - Demand Rural	TOE/a	1,401	1,438	1,457	1,475	1,495	1,514	1,534	1,552	1,571	1,590	1,609	1,628	1,647	1,666	1,685	1,705	1,724	1,744	1,764	1,785	1,805	1,826

Transport / Aviation Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Jet Demand	TOE/a	5,770	5,898	6,167	6,475	6,799	7,139	7,496	7,871	8,264	8,678	9,111	9,567	10,045	10,548	11,075	11,629	12,210	12,821	13,462	14,135	14,842	15,584
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	5,770	5,898	6,167	6,475	6,799	7,139	7,496	7,871	8,264	8,678	9,111	9,567	10,045	10,548	11,075	11,629	12,210	12,821	13,462	14,135	14,842	15,584
LGA OF BRIKAMA - Annual Demand	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF MANSAKONKO - Annual Demand	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF KEREWAN - Annual Demand	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF KUNTAUR - Annual Demand	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF GEORGETOWN - Annual Demand	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF BASSE - Annual Demand	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

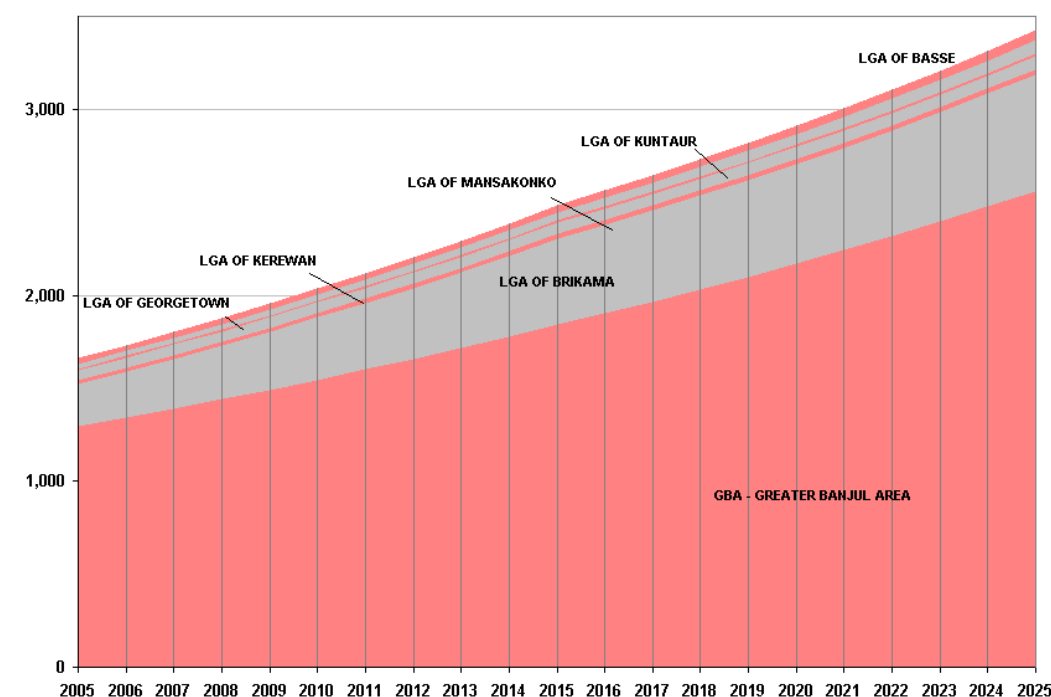
Annex (D.6)

LPG Demand Forecast (2004-2025)

D6.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	4.6	5.0	5.0
3	Customer Prices - Annual Changes	%	14.0	7.1	7.1	7.0	7.0
4	Gross Domestic Product - Annual Growth in the Service Sector	%	3.2	5.1	4.6	4.6	4.6
5	Correlation Coefficient - Annual Growth of Energy Intensity in Service Sector	%	13.6				
6	Annual LPG Consumption	TOE/a	1,590				
7	Sector Break Down - Services	%	40				
8	Sector Break Down - Residential Sector	%	60				
9	Specific Consumption - Residential Sector	TOE/cap	0.02				
10	Energy Intensity Index of LPG Consumption	%	100	100	100	100	100
11	Regional Break Down - GBA (Urban)	%	9.7				
12	Regional Break Down - LGA OF BRIKAMA (Urban)	%	3.3				
13	Regional Break Down - LGA OF MANSAKONKO (Urban)	%	3.7				
14	Regional Break Down - LGA OF KEREWAN (Urban)	%	3.8				
15	Regional Break Down - LGA OF KUNTAUR (Urban)	%	1.7				
16	Regional Break Down - LGA OF GEORGETOWN (Urban)	%	3.6				
17	Regional Break Down - LGA OF BASSE (Urban)	%	2.3				
18	Regional Break Down - GBA (Rural)	%	0.0				
19	Regional Break Down - LGA OF BRIKAMA (Rural)	%	0.8				
20	Regional Break Down - LGA OF MANSAKONKO (Rural)	%	0.4				
21	Regional Break Down - LGA OF KEREWAN (Rural)	%	0.7				
22	Regional Break Down - LGA OF KUNTAUR (Rural)	%	0.2				
23	Regional Break Down - LGA OF GEORGETOWN (Rural)	%	0.4				
24	Regional Break Down - LGA OF BASSE (Rural)	%	0.2				

D6.3 Graph



D6.2 Projection

Entire Demand																							
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	1,590	1,661	1,732	1,803	1,878	1,957	2,040	2,120	2,205	2,294	2,387	2,485	2,564	2,646	2,731	2,819	2,911	3,006	3,105	3,207	3,314	3,425
GBA - GREATER BANJUL AREA	TOE/a	1,255	1,293	1,342	1,390	1,440	1,491	1,545	1,600	1,657	1,717	1,779	1,843	1,904	1,966	2,031	2,099	2,169	2,241	2,317	2,395	2,477	2,561
LGA OF BRIKAMA	TOE/a	200	229	247	267	289	313	339	360	383	408	434	463	477	491	506	521	537	554	571	589	607	626
LGA OF MANSAKONKO	TOE/a	18	19	19	20	20	21	21	21	22	22	23	23	24	24	25	25	26	27	27	28	28	29
LGA OF KEREWAN	TOE/a	55	56	56	57	57	58	58	59	60	60	61	62	62	63	64	64	65	66	66	67	68	69
LGA OF KUNTAUR	TOE/a	9	9	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	13	13	13	14
LGA OF GEORGETOWN	TOE/a	25	27	28	30	31	33	34	36	38	40	42	45	47	49	52	54	57	60	63	66	70	73
LGA OF BASSE	TOE/a	28	28	29	30	31	32	33	34	35	36	37	38	40	41	42	44	45	46	48	50	51	53
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025

Residential Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Kerosene Demand	TOE/a	954	1,025	1,063	1,104	1,147	1,192	1,241	1,285	1,331	1,380	1,431	1,484	1,517	1,551	1,586	1,622	1,658	1,696	1,735	1,774	1,815	1,857
Total Annual Demand - Urban Areas	TOE/a	892	963	1,001	1,042	1,085	1,130	1,179	1,223	1,270	1,318	1,369	1,423	1,456	1,490	1,525	1,561	1,597	1,635	1,674	1,713	1,754	1,796
Total Annual Demand - Rural Areas	TOE/a	62	62	62	62	62	62	62	62	62	62	62	62	62	61	61	61	61	61	61	61	61	61
Percentage from Total Residential Demand - Urban Areas	%	93.5	93.9	94.2	94.4	94.6	94.8	95.0	95.2	95.4	95.5	95.7	95.8	95.9	96.0	96.1	96.2	96.3	96.4	96.5	96.6	96.7	96.7
Percentage from Total Residential Demand - Rural Areas	%	6.5	6.1	5.8	5.6	5.4	5.2	5.0	4.8	4.6	4.5	4.3	4.2	4.1	4.0	3.9	3.8	3.7	3.6	3.5	3.4	3.3	3.3
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	682	720	740	761	782	803	826	848	871	894	918	943	962	981	1,001	1,021	1,041	1,062	1,083	1,105	1,127	1,150
LGA OF BRIKAMA - Annual Demand	TOE/a	175	203	220	238	257	279	302	321	342	364	387	413	424	436	448	460	473	487	500	514	529	544
LGA OF MANSAKONKO - Annual Demand	TOE/a	14	14	15	15	15	16	16	16	17	17	17	18	18	18	19	19	19	20	20	20	21	21
LGA OF KEREWAN - Annual Demand	TOE/a	44	45	45	46	46	46	47	47	47	48	48	48	48	49	49	49	49	50	50	50	50	50
LGA OF KUNTAUR - Annual Demand	TOE/a	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5
LGA OF GEORGETOWN - Annual Demand	TOE/a	18	20	21	22	24	25	26	28	29	31	33	35	36	38	40	42	44	47	49	51	54	57
LGA OF BASSE - Annual Demand	TOE/a	16	17	18	18	19	19	20	21	21	22	23	23	24	24	25	26	26	27	28	28	29	30
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Demand Urban	TOE/a	682	720	740	761	782	803	826	848	871	894	918	943	962	981	1,001	1,021	1,041	1,062	1,083	1,105	1,127	1,150
LGA OF BRIKAMA - Demand Urban	TOE/a	150	180	196	215	235	257	281	300	322	344	368	394	406	418	430	443	457	470	484	499	514	529
LGA OF MANSAKONKO - Demand Urban	TOE/a	10	10	10	11	11	11	12	12	12	13	13	13	13	14	14	14	15	15	15	16	16	16
LGA OF KEREWAN - Demand Urban	TOE/a	26	26	26	26	26	27	27	27	27	27	27	27	27	27	27	28	28	28	28	28	28	28
LGA OF KUNTAUR - Demand Urban	TOE/a	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LGA OF GEORGETOWN - Demand Urban	TOE/a	12	13	14	15	16	18	19	20	22	23	25	27	29	30	32	34	36	38	41	43	46	48
LGA OF BASSE - Demand Urban	TOE/a	10	11	12	12	13	13	14	14	15	15	16	17	17	18	18	19	19	20	20	21	22	22
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Demand Rural	TOE/a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LGA OF BRIKAMA - Demand Rural	TOE/a	25	24	23	23	22	22	21	21	20	20	19	19	18	18	18	17	17	16	16	15	15	15
LGA OF MANSAKONKO - Demand Rural	TOE/a	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5
LGA OF KEREWAN - Demand Rural	TOE/a	18	19	19	19	20	20	20	20	20	21	21	21	21	21	21	22	22	22	22	22	22	22
LGA OF KUNTAUR - Demand Rural	TOE/a	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
LGA OF GEORGETOWN - Demand Rural	TOE/a	7	7	7	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	8	9	9
LGA OF BASSE - Demand Rural	TOE/a	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7

Transport / Aviation Sector

		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Jet Demand	TOE/a	636	636	669	699	731	764	799	836	874	914	956	1,000	1,046	1,094	1,145	1,197	1,252	1,310	1,370	1,433	1,499	1,568
		Base >>	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	572	573	602	629	658	688	719	752	787	823	861	900	942	985	1,030	1,078	1,127	1,179	1,233	1,290	1,349	1,411
LGA OF BRIKAMA - Annual Demand	TOE/a	25	26	28	30	32	34	36	39	41	44	47	50	52	55	58	61	64	67	71	74	78	82
LGA OF MANSAKONKO - Annual Demand	TOE/a	5	4	5	5	5	5	5	5	5	5	5	6	6	6	6	6	7	7	7	7	8	8
LGA OF KEREWAN - Annual Demand	TOE/a	11	11	11	11	11	12	12	12	12	13	13	13	14	14	15	15	16	16	17	17	18	18
LGA OF KUNTAUR - Annual Demand	TOE/a	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	8	8	8	9	9	9
LGA OF GEORGETOWN - Annual Demand	TOE/a	7	7	7	7	8	8	8	8	9	9	9	10	10	11	11	12	13	13	14	15	16	16
LGA OF BASSE - Annual Demand	TOE/a	12	11	12	12	12	13	13	13	14	14	15	15	16	16	17	18	19	20	20	21	22	23

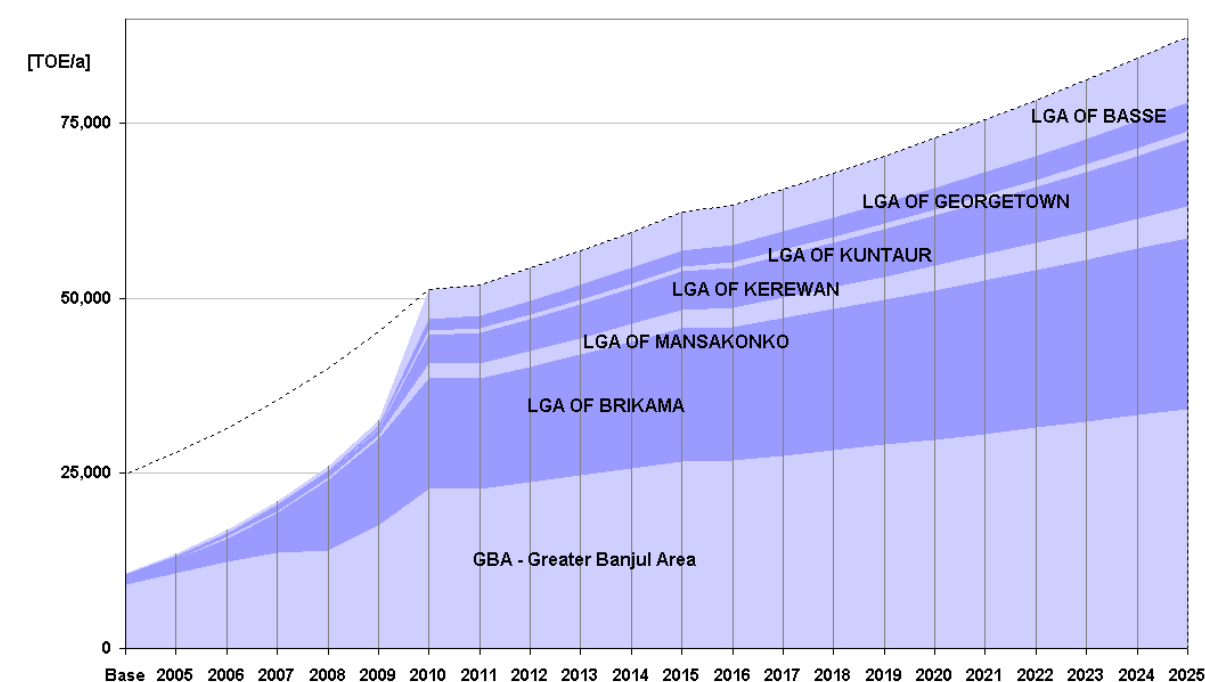
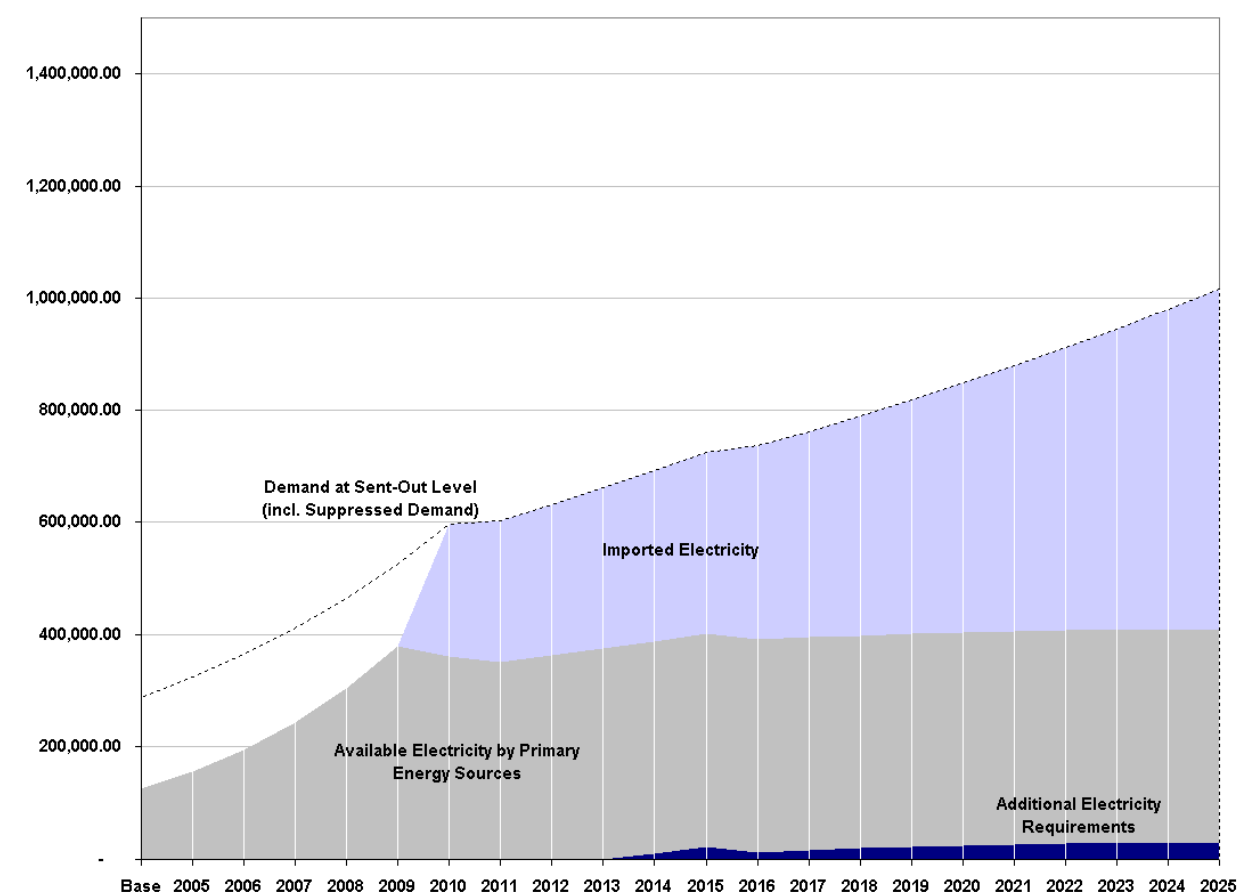
Annex (D.7)

Electricity Demand Forecast (2004-2025)

D7.1 Assumptions and Major Input-Data from other Calculations

#	Determinants	Unit	Values				
			Base >>	2005	2006-2010	2011-2015	2016-2025
0	Total Population	T	1,398				
1	Total Population - Annual Growth	%	2.8	2.8	2.8	2.7	2.6
2	Total Gross Domestic Product - Annual Growth	%	7.7	5.0	4.6	5.0	5.0
3	Customer Prices - Annual Changes	%	14.0	7.1	7.1	7.0	7.0
4	Gross Domestic Product - Annual Growth in the Service Sector	%	3.2	5.1	4.6	4.6	4.6
5	Gross Domestic Product - Annual Growth in the Industrial Sector	%	3.3	4.8	4.8	4.8	4.9
6	Gross Domestic Product - Annual Growth in the Agriculture Sector	%	29.6	3.0	4.4	4.4	4.5
7	IEA - Conversion Factor TOE/MWh	-	0.086				
8	Correlation Coefficient - Annual Growth of Energy Intensity in Industrial Sector	%	1.7	1.7	1.7	1.7	1.3
9	Correlation Coefficient - Annual Growth of Energy Intensity in Industrial Sector	%	1.8	1.8	1.8	1.8	1.6
10	Correlation Coefficient - Annual Growth of Spec. Consumption -Residential Sector	%	1.0	1.0	1.2	1.4	1.0
11	Technical and Non-Technical Losses	%	25.1	25.1	17.8	12.7	10
#	Determinants	Unit	Value	Unit	Value		
12	Total Annual Consumption at Sent-Out-Level	MWh/a	125,417	TOE/a	10,786		
13	Total Annual Losses	MWh/a	32,083	TOE/a	2,759		
14	Total Annual Billed Consumption (incl. Self Consumption)	MWh/a	93,334	TOE/a	8,027		
15	Annual Billed Consumption - Residential Sector	MWh/a	43,697	TOE/a	3,758		
16	Annual Billed Consumption - Commercial Sector	MWh/a	9,754	TOE/a	839		
17	Annual Billed Consumption - Large Customers	MWh/a	26,931	TOE/a	2,316		
18	Annual Billed Consumption - Agriculture Sector	MWh/a	4.0	TOE/a	0.3		
19	Annual Billed Consumption - Institutional Sector	MWh/a	7,474	TOE/a	643		
20	Utility's Self Consumption	MWh/a	5,474	TOE/a	471		
21	Total Annual Requirement (including Suppressed Demand)	MWh/a	289,080	TOE/a	24,861		
22	Adjusted Final Consumption - Residential Sector	MWh/a	115,579	TOE/a	9,940		
23	Adjusted Final Consumption - Commercial Sector	MWh/a	19,508	TOE/a	1,678		
24	Adjusted Final Consumption - Large Customers	MWh/a	67,328	TOE/a	5,790		
25	Adjusted Final Consumption - Agriculture Sector	MWh/a	8.0	TOE/a	0.7		
26	Adjusted Final Consumption - Institutional Sector	MWh/a	8,221	TOE/a	707		
27	Adjusted Utility's Self Consumption	MWh/a	6,021	TOE/a	518		

D7.3 Graph



Entire Demand																										
		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025			
Total Annual Demand at Sent-Out Level (including Suppressed Demand)		MWh/a	289,079	324,867	365,730	412,388	465,666	526,512	596,016	603,713	631,468	660,740	691,610	724,164	735,886	762,034	789,305	817,757	847,450	878,448	910,818	944,632	979,966	1,016,900		
Total Final Demand (including Suppressed Demand)		MWh/a	216,665	248,861	285,814	328,227	376,907	432,782	496,918	509,963	539,883	571,238	604,112	638,596	662,297	686,831	710,375	735,981	762,705	790,603	819,736	850,169	881,970	915,210		
Total Losses		MWh/a	72,414	76,006	79,916	84,161	88,759	93,731	99,098	93,750	91,585	89,503	87,498	85,567	73,589	76,203	78,931	81,776	84,745	87,845	91,082	94,463	97,997	101,690		
Total Annual Demand at Sent-Out Level (including Suppressed Demand)		TOE/a	24,861	27,939	31,453	35,465	40,047	45,280	51,257	51,919	54,306	56,824	59,478	62,278	63,286	65,535	67,880	70,327	72,881	75,546	78,330	81,238	84,277	87,453		
Total Final Demand (including Suppressed Demand)		TOE/a	18,633	21,402	24,580	28,227	32,414	37,219	42,735	43,857	46,430	49,126	51,954	54,919	56,958	58,981	61,092	63,294	65,593	67,992	70,497	73,115	75,849	78,708		
Total Losses		TOE/a	6,228	6,536	6,873	7,238	7,633	8,061	8,522	8,062	7,876	7,697	7,525	7,359	6,329	6,553	6,788	7,033	7,288	7,555	7,833	8,124	8,428	8,745		

Final Demand per Sector																									
		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		
Final Demand - Residential Sector	MWh/a	115,579	136,245	160,247	188,098	220,395	257,821	301,166	317,247	333,703	350,691	368,227	386,329	397,534	407,870	418,474	429,355	440,518	451,971	463,723	475,779	488,150	500,841		
Final Demand - Commercial Sector	MWh/a	19,508	22,996	27,047	31,748	37,199	43,516	50,833	53,547	56,324	59,192	62,151	65,207	66,902	68,642	70,426	72,257	74,136	76,064	78,041	80,070	82,152	84,288		
Final Demand - Large Customers	MWh/a	67,328	72,821	78,764	85,191	92,142	99,661	107,793	116,589	126,103	136,393	147,523	159,561	169,647	180,370	191,771	203,893	216,781	230,484	245,053	260,542	277,011	294,521		
Final Demand - Agriculture Sector	MWh/a	8.0	8.6	9.3	10.1	10.9	11.7	12.6	13.6	14.7	15.9	17.1	18.5	19.8	21.3	22.8	24.4	26.2	28.1	30.1	32.3	34.6	37.1		
Final Demand - Institutional Sector	MWh/a	8,221	9,691	11,399	13,380	15,677	18,339	21,423	22,567	23,737	24,946	26,193	27,481	28,195	28,928	29,680	30,452	31,244	32,056	32,890	33,745	34,622	35,522		
Utility's own Demand	MWh/a	6,021	7,098	8,349	9,800	11,482	13,432	15,690	16,528	17,385	18,270	19,184	20,127	20,711	21,249	21,802	22,368	22,950	23,547	24,159	24,787	25,432	26,093		
Final Demand - Residential Sector	TOE/a	9,940	11,717	13,781	16,176	18,954	22,173	25,900	27,283	28,698	30,159	31,668	33,224	34,188	35,077	35,989	36,924	37,885	38,870	39,880	40,917	41,981	43,072		
Final Demand - Commercial Sector	TOE/a	1,678	1,978	2,326	2,730	3,199	3,742	4,372	4,605	4,844	5,090	5,345	5,608	5,754	5,903	6,057	6,214	6,376	6,541	6,712	6,886	7,065	7,249		
Final Demand - Large Customers	TOE/a	5,790	6,263	6,774	7,326	7,924	8,571	9,270	10,027	10,845	11,730	12,687	13,722	14,590	15,512	16,492	17,535	18,643	19,822	21,075	22,407	23,823	25,329		
Final Demand - Agriculture Sector	TOE/a	0.7	0.7	0.8	0.9	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.3	2.4	2.6	2.8	3.0	3.2		
Final Demand - Institutional Sector	TOE/a	707	833	980	1,151	1,348	1,577	1,842	1,941	2,041	2,145	2,253	2,363	2,425	2,488	2,553	2,619	2,687	2,757	2,829	2,902	2,977	3,055		
Utility's own Demand	TOE/a	518	610	718	843	987	1,155	1,349	1,421	1,495	1,571	1,650	1,731	1,781	1,827	1,875	1,924	1,974	2,025	2,078	2,132	2,187	2,244		
Final Demand Break Down - Residential Sector	%	53.3	54.7	56.1	57.3	58.5	59.6	60.6	62.2	61.8	61.4	61.0	60.5	60.0	59.5	58.9	58.3	57.8	57.2	56.6	56.0	55.3	54.7		
Final Demand Break Down - Commercial Sector	%	9.0	9.2	9.5	9.7	9.9	10.1	10.2	10.5	10.4	10.4	10.3	10.2	10.1	10.0	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2		
Final Demand Break Down - (Agro-) Industrial	%	31.1	29.3	27.6	26.0	24.4	23.0	21.7	22.9	23.4	23.9	24.4	25.0	25.6	26.3	27.0	27.7	28.4	29.2	29.9	30.6	31.4	32.2		
Final Demand Break Down - Institutional Sector	%	3.8	3.9	4.0	4.1	4.2	4.2	4.3	4.4	4.4	4.4	4.3	4.3	4.3	4.2	4.2	4.1	4.1	4.1	4.0	4.0	3.9	3.9		
Utility's own Demand	%	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.0	3.0	3.0	2.9	2.9	2.9	2.9		
		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025		

Projection of Suppressed / Unserved Energy		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand at Sent-Out Level (including Suppressed Demand)	MWh/a	289,079	324,867	365,730	412,388	465,666	526,512	596,016	603,713	631,468	660,740	691,610	724,164	735,886	762,034	789,305	817,757	847,450	878,448	910,818	944,632	979,966	1,016,900
Projected Available Annual Electricity at Sent-Out Level	MWh/a	125,417	156,486	195,252	243,620	303,971	379,273	614,273	631,273	648,273	665,273	682,273	702,149	723,330	745,899	769,950	795,577	822,886	851,987	882,996	916,040	951,251	988,772
Projected Available Annual Electricity by Electricity Imports	MWh/a	-	-	-	-	-	-	235,000	252,000	269,000	286,000	303,000	322,876	344,057	366,626	390,677	416,304	443,614	472,714	503,723	536,767	571,978	609,499
Projected Available Annual Electricity transformed by Primary Energy	MWh/a	125,417	156,486	195,252	243,620	303,971	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273
Balance >> Deficit / Surplus	MWh/a	163,662	168,381	170,479	168,768	161,695	147,239	-18,257	-27,560	-16,805	-4,533	9,337	22,014	12,556	16,135	19,366	22,180	24,563	26,461	27,822	28,592	28,715	28,128
Adjusted Annual Electricity to be transformed by Primary Energy (mid-term projects)	MWh/a	125,417	156,486	195,252	243,620	303,971	379,273	361,016	351,713	362,468	374,740	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273	379,273
Additional Annual Electricity to be transformed by Primary Energy (long-term projects)	MWh/a	-	-	-	-	-	-	-	-	-	-	9,337	22,014	12,556	16,135	19,366	22,180	24,563	26,461	27,822	28,592	28,715	28,128

Projection of Suppressed / Unserved Energy

		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Proportion of Unserved Energy	%	57	52	47	41	35	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated Demand which can be served	MWh/a	125,417	156,486	195,252	243,620	303,971	379,273	596,016	603,713	631,468	660,740	691,610	724,164	735,886	762,034	789,305	817,757	847,450	878,448	910,818	944,632	979,966	1,016,900
Total Annual Demand at Sent-Out Level (including Suppressed Demand)	TOE/a	24,861	27,939	31,453	35,465	40,047	45,280	51,257	51,919	54,306	56,824	59,478	62,278	63,286	65,535	67,880	70,327	72,881	75,546	78,330	81,238	84,277	87,453
Projected Available Annual Electricity at Sent-Out Level	TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	52,827	54,289	55,751	57,213	58,675	60,385	62,206	64,147	66,216	68,420	70,768	73,271	75,938	78,779	81,808	85,034
Projected Available Annual Electricity by Electricity Imports	TOE/a	-	-	-	-	-	-	20,210	21,672	23,134	24,596	26,058	27,767	29,589	31,530	33,598	35,802	38,151	40,653	43,320	46,162	49,190	52,417
Projected Available Annual Electricity transformed by Primary Energy	TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617
Balance of Deficit / Surplus	TOE/a	14,075	14,481	14,661	14,514	13,906	12,663	-1,570	-2,370	-1,445	-390	803	1,893	1,080	1,388	1,665	1,907	2,112	2,276	2,393	2,459	2,470	2,419
Adjusted Annual Electricity to be transformed by Primary Energy (mid-term projects)	TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	31,047	30,247	31,172	32,228	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617	32,617
Additional Annual Electricity to be transformed by Primary Energy (long-term projects)	TOE/a	-	-	-	-	-	-	-	-	-	-	803	1,893	1,080	1,388	1,665	1,907	2,112	2,276	2,393	2,459	2,470	2,419
		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Proportion of Unserved Energy	%	57	52	47	41	35	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estimated Demand which can be served	TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	51,257	51,919	54,306	56,824	59,478	62,278	63,286	65,535	67,880	70,327	72,881	75,546	78,330	81,238	84,277	87,453

Demand which can be served by Region (Sent-Out Level)

		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	MWh/a	125,417	156,486	195,252	243,620	303,971	379,273	596,016	603,713	631,468	660,740	691,610	724,164	735,886	762,034	789,305	817,757	847,450	878,448	910,818	944,632	979,966	1,016,900
		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	MWh/a	106,604	125,189	144,486	158,353	163,416	203,898	264,720	264,815	275,701	287,404	298,676	309,708	312,281	320,482	328,985	337,803	346,949	356,438	366,285	376,506	387,119	398,140
LGA OF BRIKAMA - Annual Demand	MWh/a	12,542	21,864	38,116	66,449	115,843	144,540	184,674	184,526	192,028	200,108	210,838	222,419	220,981	227,641	234,384	241,203	248,095	255,054	262,072	269,143	276,259	283,411
LGA OF MANSAKONKO - Annual Demand	MWh/a	1,003	1,472	2,160	3,169	3,891	4,855	23,451	24,690	26,188	27,706	29,124	30,714	32,408	34,213	36,136	38,186	40,370	42,697	45,177	47,819	50,635	53,636
LGA OF KEREWAN - Annual Demand	MWh/a	2,060	3,023	4,435	6,507	7,989	9,968	48,153	50,698	53,774	56,891	59,803	63,068	66,545	70,251	74,201	78,409	82,894	87,672	92,765	98,191	103,973	110,134
LGA OF KUNTAUR - Annual Demand	MWh/a	266	389	570	837	1,028	1,282	6,193	6,520	6,916	7,317	7,691	8,111	8,568	9,036	9,543	10,084	10,661	11,276	11,930	12,628	13,372	14,164
LGA OF GEORGETOWN - Annual Demand	MWh/a	883	1,296	1,901	2,790	3,425	4,273	20,643	21,734	23,053	24,389	25,638	27,037	28,528	30,117	31,810	33,614	35,537	37,585	39,768	42,094	44,573	47,215
LGA OF BASSE - Annual Demand	MWh/a	2,061	3,025	4,438	6,511	7,994	9,975	48,182	50,729	53,807	56,926	59,839	63,106	66,586	70,294	74,246	78,457	82,944	87,726	92,821	98,250	104,036	110,201

Demand which can be served by Region (Sent-Out Level)

		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Annual Demand	TOE/a	10,786	13,458	16,792	20,951	26,142	32,617	51,257	51,919	54,306	56,824	59,478	62,278	63,286	65,535	67,880	70,327	72,881	75,546	78,330	81,238	84,277	87,453
		Base	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
GBA - Greater Banjul Area - Annual Demand	TOE/a	9,168	10,766	12,426	13,618	14,054	17,535	22,766	22,774	23,710	24,717	25,686	26,635	26,856	27,561	28,293	29,051	29,838	30,654	31,500	32,380	33,292	34,240
LGA OF BRIKAMA - Annual Demand	TOE/a	1,079	1,880	3,278	5,715	9,962	12,430	15,882	15,869	16,514	17,209	18,132	19,128	19,004	19,577	20,157	20,743	21,336	21,935	22,538	23,146	23,758	24,373
LGA OF MANSAKONKO - Annual Demand	TOE/a	86	127	186	273	335	418	2,017	2,123	2,252	2,383	2,505	2,641	2,787	2,942	3,108	3,284	3,472	3,672	3,885	4,112	4,355	4,613
LGA OF KEREWAN - Annual Demand	TOE/a	177	260	381	560	687	857	4,141	4,360	4,625	4,893	5,143	5,424	5,723	6,042	6,381	6,743	7,129	7,540	7,978	8,444	8,942	9,472
LGA OF KUNTAUR - Annual Demand	TOE/a	23	33	49	72	88	110	533	561	595	629	661	698	736	777	821	867	917	970	1,026	1,086	1,150	1,218
LGA OF GEORGETOWN - Annual Demand	TOE/a	76	111	164	240	295	368	1,775	1,869	1,983	2,097	2,205	2,325	2,453	2,590	2,736	2,891	3,056	3,232	3,420	3,620	3,833	4,060
LGA OF BASSE - Annual Demand	TOE/a	177	260	382	560	687	858	4,144	4,363	4,627	4,896	5,146	5,427	5,726	6,045	6,385	6,747	7,133	7,544	7,983	8,450	8,947	9,477