Assessment of Investment & Financial Flows for mitigation in the Energy Sector

1.   Introduction

1.1   Objective

The objective of assessment exercise for investments & financial flows (I&FF) is to strengthen national capacities of the team members of the Energy sector in order to enable the assessment and development of policy options that address climate change in the energy and other economic sector activities to address climate change activities. It is anticipated that the assessment could also contribute to national climate change policy strategies by engaging line ministries and encouraging an enabling environment.

One major activity is to conduct an assessment of investment and financial flows to address climate change mitigation options for selected key sectors. It is anticipated that the assessments could contribute to national climate change policy strategies by engaging line ministries and encouraging an enabling environment.

1.2 Background

1.2.1 Review of Previous Analyses

In the Gambia, the following analyses were conducted to assess the energy sector for mitigation purposes.

1.2.1.1 Initial National Communications of The Gambia to the UNFCCC

The first GHG inventory was reviewed with the possibility of data improvement for Energy and Transport. The inventory data for the first GHG inventory for Energy for 2003 is composed as follows in the table below:

From Table 2.1 below, total emissions due to fuel combustion and based on the 1996 IPCC Guidelines, consist of 181,064 tonnes (t) CO_2, 2,911 t CH_4, 40 t N_2O, 54,536 t CO, and 6,987 t NMVOC. CO_2 constitutes 73% of the emissions while CO represents 22% (Figure 2.1).

The total CO_2 emissions is 181,064 tonnes (t) with road transport emitting 108,638 the energy industries emitted 54,319 and manufacturing industries emit 3,106 of the CO_2. The residential sub-sector emitted over 99% (2.9 Gg) or 2,882 t CH_4. Energy Industries emitted about 94% of the total N_2O emitted, the manufacturing and construction industries emitted about 6% while the combined emissions of the remaining sectors is insignificant. The residential and road transport sub-sectors are responsible for the bulk of NOx emissions from the energy sector. Together, they emit about 93% of the total, while energy industries emit about 7%. The residential sub-sector emitted 47,000 t (47 Gg) and the road transport sub-sector emitted 6,000 t (6 Gg) of the total CO emissions. Similar to the emissions of CO, 86% or 6,000 t (6 Gg) of the NMVOC emissions are from the residential sub-sector while 14% or 1,000 t (1 Gg) came from the road transport sub-sector.

Table 2.1 Table on Emissions of GHGs from the energy sector in 2000							
	CO$_2$	CH$_4$	N$_2$O	NOx	CO	NMVOC	SO$_2$
	(t)						
Tptal	181,064	2,911	40	2,224	54,536	6,987	
Energy Industries	54,319	29	38	156	536		
Manufacturing Industries and Construction	3,106		2	68			
Road Transport	108,638			1,000	6,000	978	
Commercial/Institution	8,000				1,000		
Residential	4,000	2,882		1,000	47,000	6,009	
Agriculture/Forestry/ Fisheries	3000						

Source: INC of The Gambia to the IPCC

1.2.1.2 Second National Inventory of GHG

The Second National Inventory of GHG was conducted was conducted in 2008. The results of this exercise also confirmed the contribution of various sector in the energy matrix to GHG emission.

1.2.1.3 National Adaptation Plan of Action (NAPA)

With regards to the NAPA, the Energy sector analyses were conducted in The Gambia in 2005. As in the previous analyses, some mitigation options were defined as a way of addressing adaptation to climate change.

The outcome of the various assessment of energy sector impact on climate change and mitigation strategies identified were discussed in public fora. One of the strategies on the assessments was to bring the results to public officers, including policy makers. In addition to the information and education of public officers, the direct involvement of sector specialists in the assessment processes (INC, SNC and NAPA) provided direct inspiration for incorporation of mitigation and other climate change issues in sector policies. In the energy sector, the assessment results all point to the huge contribution of energy production to climate change. Therefore, the issues of mitigation options using clean and sustainable energy generation and energy efficient technologies have been incorporated in the National Energy Policy 2005 (NEP 2005) and in sectoral strategic plan for 2010 – 2014.

1.2.2 Institutional Arrangements and Collaborations

The arrangements for conducting this exercise have been drawn from sectors that have direct link with the energy sector - either in policy and decision making, data collection/management or in the national financial/economic institution. The experts for the investment and financial flow were drawn from taskforce members of the Mitigation team of the Second National communication The energy mitigation team constituted members of the energy task force who have relevance to the assignment, as recommended by the I&FF guide.

The Director of Energy of the Ministry of Energy and author of the National paper on Energy heads the team. The following Government ministries and institutions are represented on the energy sector assessment team: the Principal Energy Officer at the Ministry of Energy as Energy Expert, the Senior

Energy Officer Gambia Renewable Energy Centre and Renewable Energy Expert, Economist at the Ministry of Economic Planning and Industry as Finance/Economics Expert and a Statistical Expert from the Gambia Bureau of Statistics.

The I&FF assessment draws on a number of disciplines and requires inputs from a broad group of stakeholders (Ministries, NGOs, private sector, etc.). The role of the energy sector team leader is to oversee the work of the experts and/or institutions providing inputs for the sector, and to ensure that the sectoral I&FF assessment is finalised according to agreed deadlines.

This involves the coordination of the collection and compilation of data and information on the key sectors of energy and liaise with relevant Ministries and other institutions/companies as may be required. In addition the group also ensures the I&FF sectoral assessment using the methodology provided and take lessons from national activities such as National Communications, NAPA, sectoral plans, etc.

In particular, the sector team leader ensures that the sectoral I&FF assessment for which he is responsible: (i) follows the UNDP methodology for assessing I&FF; (ii) is technically reviewed by national experts, the supporting regional centre of excellence and UNDP; (iii) is presented in a format based upon the guidance in the UNDP document, Reporting Guidelines for the Assessment of Investment and Financial Flows to Address Climate Change; and (iv) has all decisions, assumptions, data and resources documented and archived.

The sector team leader is assisted by:

a) The energy expert assigned to Specifically conduct the following activities: (i) Define a baseline scenario in year 2005 by describe socio-economic trends, technological change, sectoral and national plans, and expected investment given current sectoral and national plans and (ii) Evaluate the policy implications of the mitigation scenario and Re-evaluate initial prioritisation of mitigation measures undertaken in step 5 of the Workplan for Investment and Financial Flow;

b) The renewable energy expert will (i) calculate the changes in IF, FF and O &M costs, and in subsidy costs if included explicitly, needed to implement mitigation in terms of cumulative IF, FF and O&M costs, annual IF, FF and O&M costs, if subsidies are included explicitly, consider calculating changes in cumulative and or in annual subsidies for each investment type and all investment types;

c) The finance/economics expert will estimate annual Investment Flow (IF), Financial Flow (FF) and Operations and Maintenance (O &M) costs, and subsidy costs if included explicitly for baseline scenario for each investment type, disaggregated by investment entity and funding source; and

d) Statistical expert will compile relevant historical, current and projection data to elaborate future energy sector scenarios in terms of annual investment flow and financial flow, annual operational and maintenance data, disaggregated by investment entity and source, annual subsidy cost data, if subsidies are included explicitly in the assessment and other input data.

1.2.3 Basic Methodology and Key Terminology

Basic methodology

1. Establish the key parameters of the assessment
   - Define the detailed scope of the sector.
   - Specify assessment period and base year.
   - Identify preliminary mitigation (or adaptation) measures.
   - Select analytical approach.

2. Compile historical IF, FF, and O&M cost data, subsidy cost data (if included explicitly), and other input data for scenarios
   - Compile historical annual IF and FF data, disaggregated by investment entity and source;
   - Compile historical annual O&M cost data, disaggregated by investment entity and source;
   - Compile historical annual subsidy cost data, if subsidies are included explicitly in the assessment; and,
   - Compile other input data for scenarios.

3. Define the baseline scenario
   - Describe socioeconomic trends, technological change, sectoral and national plans, and expected investments given current sectoral and national plans.

4. Estimate annual IF, FF, and O&M costs, and subsidy costs if included explicitly, for the baseline scenario
   - Estimate annual IF and FF for each investment type, disaggregated by investment entity and funding source;
   - Estimate annual O&M costs for each IF, disaggregated by investment entity and funding source; and,
   - Estimate annual subsidy costs for each relevant investment type and for IF, FF, and O&M costs, if subsidies are included explicitly in the assessment.

5. Define mitigation (or adaptation) scenario
   - Describe socioeconomic trends, technological change, mitigation (or adaptation) measures, and investments given implementation of mitigation (or adaptation) measures.

6. Estimate annual IF, FF, and O&M costs, and subsidy costs if included explicitly, for mitigation (or adaptation) scenario
   - Estimate annual IF and FF for each investment type, disaggregated by investment entity and funding source;
   - Estimate annual O&M costs for each IF, disaggregated by investment entity and funding source; and,
   - Estimate annual subsidy costs for each relevant investment type and for IF, FF, and O&M costs, if subsidies are included explicitly in the assessment.
   -

7. Calculate the changes in IF, FF, and O&M costs, and in subsidy costs if included explicitly, needed to implement the mitigation (or adaptation) measures
   - Calculate changes in cumulative IF, FF, and O&M costs, by funding source, for individual investment types and for all investment types;
   - Calculate changes in annual IF, FF, and O&M costs for individual investment types, for individual sources of funds, and for all investment types and funding sources;

- If subsidies are included explicitly, consider calculating changes in cumulative and/or in annual subsidies for IF, FF, and O&M for each investment type and all investment types.

8. Evaluate policy implications
- Re-evaluate the initial priority mitigation (or adaptation) measures undertaken in step #5;
- Analyze feasibility and compatibility with development and sector plans
- Determine policy measures to encourage changes in I&FF; and,
- Consider a variety of instruments, including incentives, economic instruments (e.g., taxes), regulatory instruments (e.g., fuel portfolio standards), voluntary agreements, education, information dissemination and other instruments (e.g., research, development, and demonstration (RD&D) programmes).

Key terminology

The Investment and Financial Flows (I&FF) methodology distinguishes between two distinct types of investments: investment flows and financial flows. An "investment flow" (IF) is the capital cost of a new physical asset with a life of more than one year, such as the capital cost of a new power plant, a new automobile, a new household appliance, or a new agricultural irrigation system. Investment flows are limited to new physical assets because such investments have climate change implications for the duration of the operating lives of the facilities and equipment purchased. It excludes the purchase of an existing physical asset, such as an existing vehicle. However, investment flows to retrofit, or considerably expand, an existing physical asset such that the climate change implications of that asset are significantly altered would be included in IF. Investments in financial assets (such as stocks and bonds), and in physical assets that neither affect climate nor have climate impacts implications are also excluded because they are unrelated to climate concerns.

'Financial flow' (FF) is an ongoing expenditure on programmatic measures, the costs of operation and maintenance (O&M) of new assets (e.g., salaries of personnel, fuel costs) and encompass expenditures other than those for expansion or installation of new physical assets.

'Operation and Maintenance' (O&M) Costs is associated with physical assets purchased with investment flows and will have operation and maintenance (O&M) costs associated with them (i.e., ongoing fixed and variable costs such as salaries and raw materials). Operation and maintenance costs of new assets need to be included in I&FF assessments because these costs can vary considerably among investment flow types, and can have a significant effect on the total cost of an investment over its lifetime. For example, O&M costs are a much greater share of total costs (capital costs plus O&M costs) for gas-fired electricity generation than photovoltaic electricity generation. O&M costs include the following categories of costs: Salaries or wages of personnel, Fuel costs such as power and/or fuel for operations, fuel for production, Public utilities such as telephone service, Internet connectivity, etc., Raw materials, Maintenance and/or leasing of equipment, Office supplies and consumables, Advertising, insurance, etc

An "investment entity" is an entity that is responsible for an investment. This methodology utilizes three types of investment entities: households, corporations, and government. These are described below:
  i. Households are individuals or groups of individuals (e.g., families) who act as one unit financially.
  ii. Corporations include both financial corporations and non-financial corporations, and can be either for-profit or not-for-profit.

iii. Governments are the national, provincial, state, and local governments of a country. Financial and non-financial corporation's owned wholly or in part by governments, such as public universities and research institutions, and publicly held oil companies, utilities, and water authorities, are included in this category.

The "sources of the I&FF funds" are the origins of the funds invested by the investment entities. They can be both domestic and foreign, and can be in the form of equity, debt, domestic government assistance (subsidies), or foreign aid or official development assistance.

A 'scenario' is an internally consistent and plausible characterization of future conditions over some specified time period. Each sectoral I&FF assessment for mitigation (or adaptation) requires that both a baseline scenario and a mitigation scenario be developed for that sector. In the I&FF assessment methodology, each scenario will have associated with it a stream of annual IF, FF, and O&M costs.

The relevant investment costs for a sector are projected for two scenarios: 1) a baseline scenario, which reflects a continuation of current policies and plans, i.e., "business-as-usual" scenario, and 2) a mitigation scenario, in which new policy measures are introduced to forestall continued GHG emission in order to reduce climate change scenario. The investment costs of the baseline and mitigation scenarios are then compared to determine the changes in investments needed to mitigate emissions from the sector. Note that changes in investments may include not only increases in investments (new funding), but also shifts in existing investments (reallocations of existing and currently projected funding levels such that funds in one area decrease, and funds in another area increase).

The 'baseline scenario' in both cases is a reflection of business-as-usual or non-policy case conditions, i.e., it is a description of what is likely to occur in the absence of new policies to address climate change. The baseline scenario describes expected socioeconomic trends (e.g., population growth and migration, economic growth), technological change (if relevant), private sector and government plans for the sector, and expected business-as-usual investments in the sector (i.e., specific new assets and programs) given those trends and plans. If policies to address climate change are already being implemented, they should be reflected in the baseline scenario. The description of the plans or forecasts for investments should include information about the nature, scale, and timing of those investments; i.e., information that is needed to derive estimates of annual I&FF, and associated O&M costs.

The 'mitigation scenario' describes a scenario that incorporates policy measures to mitigate GHG emissions. This includes policy measures that describe expected socioeconomic trends, technological change (if relevant), new measures to mitigate GHG emissions, and the expected investments in the sector given implementation of the mitigation measures. Mitigation scenarios should include information about the nature, scale, and timing of the investments.

'Assessment Period' refers to the time frame for the assessment; i.e., the number of years spanned by the baseline and climate change scenarios and the associated stream of annual IF, FF, and O&M costs. The assessment period for I&FF assessment should be at least 20 years and not more than 30 years. The base year is the first year of the assessment period, i.e., it is the first year of the baseline, mitigation, and adaptation scenarios. The base year should be set at a recent year for which I&FF and O&M information is available so that the IF, FF, and O&M costs for the first year of all the scenarios are historical data. This grounds the start of the streams of cost data for each scenario in reality.

Chapter 2: Scope, Data Inputs, and Scenarios

2.1 Sectoral Scope

The Energy team scoped and screened from a wide variety of mitigation options to be included in the assessment exercise according to The Gambia's country development needs and strategies as well as that of the policy and strategy of the Ministry of Energy (e.g., cost effectiveness; GHG mitigation potential, etc.). Some of the mitigation options involve switching from technologies or energy carriers with high GHG emissions to cleaner alternatives, measures to improve end users' energy efficiency or reducing fugitive emissions from energy distribution or transportation services. It is important to note that some energy related mitigation options have been excluded to avoid double counting. For example, that is the case of mitigation options associated with the production of woody and agricultural biomass for biofuel production (e.g., to reduce N_2O emissions from fertilizer use). These can be seen mainly as forestry and agriculture mitigation options.

According to the Report on the Second National Communications in the energy sector in The Gambia, the energy sector contributed 1593.39 Giga grams (Gg) of CO_2 in 2006 compared to 885.7 Gg of CO_2 in 1995. This is an increase 707.69 or 80% increase in CO_2 over the period. By segregated data, residential sector account for 78%, transport sectors 11% and electricity generation 8%. According to the Second National Communication, the energy sector contributes the greatest amount of the GHG emission for 2006. Consequently, the energy sector, which is now the most polluting sector, could contribute significantly in mitigating national GHG emissions with adoption of mitigation options.

It is widely accepted that the current patterns of energy production and use are very inefficient and therefore not sustainable. In the traditional energy (biomass) sub-sector, energy consumption is leading to depletion of natural forests and therefore contributing to drought and desertification in our region, emission of green house gases (GHG) that contributed to global warming resources, among other negative social and environmental consequences.

In addition, the negative impact of continued widespread and unsustainable use of traditional biomass would be aggrevated by increase in population. This would undoubtedly exert more pressure on the scarce and limited resources and lead to (i) more time used for firewood by women and children, (ii) increase in the price of alternative fuels and thereby increasing the household economic balance in the urban and peri-urban populations in favour traditional biomass at the expense of other household requirements such as food, etc; (iii) desertification and drought leads to loose of soil cover and nutrients and thereby affecting agricultural productivity and hence food security; and (iv) indoor air pollution affecting mainly women, and the associated health risks.

Therefore, since over 90% of the population depend on traditional mass for cooking, introducing this mitigating measure would positively have effect on(i) the indoor air quality, (ii) save the forest against the adverse effects of destruction; (iii) reduce the emission of GHG, (iv) save income since the cost for LPG may be cheaper that woodfuels with some interventions; and (v) save time to collect the wood in the rural areas, which could be used for more productive uses.

In the identification of mitigation sectoral scope for The Gambia, cooking fuel substitute ranks the highest priority with the greatest potential to reduce GHG emission. Maintaining the consumption of fuelwood and other domestic fuels for 2006 at the 1995 figures would reduce GHG emission by 62%. This is followed by the transport sector and then the electricity production.

Following sector meetings on the sectoral scope, the Energy Team members decided to select the cooking fuels substitute and liquefied petroleum gas (LPG) was decided as the substitute.

There are several mitigation options that are available for consideration and therefore this mitigation option is ONLY one of the many options being undertaken by Government. Taking this one option for this study does not imply that there are no other options and that the scenarios indicated would not change. In short, the approach of using only one option for this study was based on technical and time constraints since all the options cannot be analyzed.

The technical constraints were marred by availability of data and resource constraints for the Energy team on the analysis of the one mitigation option based on the rationale that more than 80% of energy consumption in the resident sector comes from fuelwood. Analysis was done based on availability of data and even getting the LPG data was a nightmare.

In the justification of opting for LPG as an option, consideration was given to the amount or percentage of GHG emission from the initial national communications to pre-select the residential sector with the biggest percentage of GHG emission. However, there were no GHG figures used in selecting this option to mitigate the high fuelwood consumption. If the quantity of any fuel used increases, the emission will automatically increase. Comparison with other options is a different matter and the approaches have to be uniform such as using global warming potentials (GWP).

The implementation of this mitigation option would certainly require investment and hence forex and would certainly increase the forex outflow. However, all mitigation options would have to studied further into in terms of the cost/benefit analyses and the comparative advantages. Already without the anticipated LPG increment as a mitigation measure, the country is already utilizing forex to pay for some of its fuelwood and charcoal demand from neighbouring Senegal (according to recent studies), which is contributing to negative environmental consequences within the region beyond The Gambia.

The other mitigation options include waste to energy by using solid waste for electricity. This option has to be careful investigated as more than 50% of our waste is sand. Briquetting of groundnut shell is another option that the Ministry of Energy even has a concrete proposal on but not all of the options could be studied. For this option, further consideration should be given to the sustainability of supply of the waste to feed the demand.

In the implementation of any option, it is important not only to renew and expand the energy service delivery but it is equally important to give attention to maintenance of facilities and to make the service deliver, including the operation and maintenance (of any facilities including generators) more efficient. This is the ideal situation and all stakeholders including operators should be sensitized on this.

2.2 Data Inputs and Scenarios

2.2.1 Assessment Period and Cost Accounting Parameters

The base year of the assessment, year is chosen as 2005 in view of the availability of data and some historic data before this year and a few more data after. The assessment period for the exercise has also

been agreed as 2005 – 2030. In the utilization of the currency in the exercise, the Gambian Dalasi (GMD) was converted to constant 2005 USD. The central bank policy rate of 19 per cent is used to compute the Present Value. The current value of the Dalasi was first deflated using the CPI and then converted to US$. The exchange rate used is taken from the Central Bank of The Gambia Annual Reports where 1US$ is equal to GMD 28.13.

2.2.2 Analytical Approach

In the approach used to develop the methodology for the scenarios, consideration was given to data availability. The baseline year has been set for 2005. In 2005, the Government of The Gambia adopted the National Energy Policy (NEP 2005) that recognises the need to expand the fuel storage capacity of the country to include bulk storage facility for the liquefied petroleum gas (LPG) for the first time in the history of the country.

LPG has been used for a long time in The Gambia since the early 1980s. In early 1990, the Government, with support of the European Development Fund (EDF) Commission, popularized the use of LPG so as to make it an alternative cooking fuel to fuelwood and charcoal.

The base year therefore marks the beginning of a major investment and financial flow in this alternative fuel.

2.2.3 Historical IF, FF, and O&M Data, and Subsidies

Data availability in The Gambia, like most African, remains one of the major bottlenecks in most project planning and development. Data availability for LPG is therefore no exception. The LPG data available for imports is estimated as net consumption.

Import Data = Consumed Data = import + production – Export – Losses

In this equation the variables of Production, Export and Losses are zero.

Therefore, estimates for import data for LPG available at the Ministry of Energy (MOE) indicated below, was used.

Table 2.2.1: Liquefied Petroleum Gas (LPG) consumption 1990 – 2007

Year	Consumption (Ton)	variation
1990	750.00	
1991	774.00	0.031
1992	800.00	0.033
1993	864.00	0.074
1994	900.00	0.040
1995	1,035.00	0.130
1996	1,078.00	0.040
1997	1,121.12	0.038
1998	1,165.96	0.038

1999	1,212.60	0.038
2000	1,261.11	0.038
2001	1,311.55	0.038
2002	1,364.01	0.038
2003	1,418.57	0.038
2004	1,475.32	0.038
2005	1,534.33	0.038
2006	1,595.70	0.038
2007	1,659.53	0.038
	Total	0.771
	Average	0.043

Source: MOE

From this available data, the 2008 data was estimated and that for 2009, 2010 and 2011 (for the first 3 months) LPG data was provided by the Ministry of Energy (MOE) as follows:

Table 2.2.2: Imports of LPG for 2009 – 2011

Year	2008	2009	2010	2011
Quantity imported	NA	2,250T	2,250T	750T
Cost in USD	NA	$ 1,858,400	$2,467,900	$970140

Source: MOE

2.2.4 Baseline Scenario

In the analyses of the LPG data, the following assumptions were made:
1. All the imported data from 2009 are considered as the official data of consumption since there is only one bulk storage facility whose operator imports all the LPG for the distribution companies.
2. The O&M cost for operator of the bulk storage facility (GAMPETROLEUM) is four (4) staff at an annual budget of $500x12x4 = $24,000.00.
3. The O&M for vehicles and other operational machines are for GAMPETROLEUM are negligible since only 4 staff are assigned to the LPG facility. The bulk of the O&M cost of operation is born by the 3 main distribution companies of TOUBA GAS, GAMGAS and MUSA GAS. This is backed by the fact that one thousand metric ton (1,000 MT) out of fifty-one thousand (51,000 MT) of the bulk storage facility is used for LPG storage that has a small bottling plant and not operational most of the time. The major distribution companies all have their bottling plant and therefore account for the bulk of the O&M.
4. The cost of LPG is included in the financial flow (FF).
5. Major investments since 2005 were mostly by done by GAMPETROLEUM and projected at selected intervals depending on the capacity of the storage facilities.
6. On the O&M estimates, there are 3 major distribution companies for LPG and the data was obtained from one of the them who willingly provided his data.
7. On the basis of this information and since this company has about 26.7% of the distribution market, overall investments and O&M of this company use used to project the total O&M cost of operation.

Table 2.2.3: Investments and O&M Costs for the Distribution Companies

Invest Flow for One Distr.:	Base Year	All Distr. 2005	2007
Cylinders	216,000.00	810,000.00	203,389.83
Office/Building	600,000.00	2,250,000.00	400,000.00
Vehicles	6,101.69	22,881.36	371,822.03
Refilling plant	54,000.00	202,500.00	
Generator	24,390.24	91,463.41	
Total	900,491.94	3,376,844.77	975,211.86
Financial Flow			
Salaries	96,000.00	360,000.00	
office maintenance	13,559.32	50,847.46	
vehicles running	40,677.97	152,542.37	
Utilities	4067.80	15,254.24	
Taxes/Insurance	5,762.71	21,610.17	
Plant Maintenance	13,559.32	50,847.46	
Total	173,627.12	651,101.69	

Table 2.2.4: Population Estimates and Variations for the Urban Area (Greater Banjul Area – GBA) 2003

Population figures 2003	2003 Census Population	Variation since 1993 Census (%)
Kombo South	166,351.00	107
Kombo North	62,531.00	58
Brikama Kombo Central	84,315.00	50
Banjul	34,828.00	-18
Kanifing	322,410.00	41
TOTAL	670,435.00	47.60
National Total	1,364,507.00	

In 10 years, the average annual variation for the Greater Banjul Area (GBA) is 4.7%, which is very close to the average variation of 4.2% for LPG consumption over the past 10 years.

In the analyses of the data for the base year, the annual estimated consumption data for LPG have been projected based on:
- The annual population increment for the urban and peri-urban areas of the Greater Banjul Area.
- Consideration of other alternatives fuels and promotion of clean cookstoves by the Ministry of Energy, in the business as usual scenario.

The projections for the investment flow during this period is included the following assumptions. Major investments flows are projected based on the capacity needs for expansion of storage facility for LPG. As the consumption picks up with 4.7% increase, with the business as usual scenario, investments have been projected to be made in the following years and with 5% increment after discounting: 2012 and 2028.

The investment base is composed of loans in the form of foreign borrowing (from E&Co, Senegal, etc) and domestic borrowing.

Table 2.2.5: Business As Usual Scenario

Year	Cons (Ton)	Cost/ton (USD)	FF
2005	1,534.33	750.00	1,150,747.60
2006	1,595.70	810.00	1,292,519.70
2007	1,659.53	874.80	1,451,758.13
2008	1,729.23	944.78	1,633,750.53
2009	1,801.86	1,020.37	1,838,557.50
2010	1,877.54	1,400.00	2,628,552.68
2011	1,956.39	1,470.00	2,875,899.49
2012	2,038.56	1,543.50	3,146,521.63
2013	2,124.18	1,620.68	3,442,609.32
2014	2,213.40	1,701.71	3,766,558.85
2015	2,306.36	1,786.79	4,120,992.04
2016	2,403.23	1,876.13	4,508,777.39
2017	2,504.16	1,969.94	4,933,053.35
2018	2,609.34	2,068.44	5,397,253.67
2019	2,718.93	2,171.86	5,905,135.24
2020	2,833.13	2,280.45	6,460,808.46
2021	2,952.12	2,394.48	7,068,770.54
2022	3,076.11	2,514.20	7,733,941.85
2023	3,205.30	2,639.91	8,461,705.77
2024	3,339.93	2,771.90	9,257,952.29
2025	3,480.20	2,910.50	10,129,125.60
2026	3,626.37	3,056.02	11,082,276.31
2027	3,778.68	3,208.83	12,125,118.52
2028	3,937.38	3,369.27	13,266,092.17
2029	4,102.75	3,537.73	14,514,431.44
2030	4,275.07	3,714.62	15,880,239.44

Table 2.2.6: Business As Usual Scenario O&M Costs

	Year	IF (USD)	O&M (USD)
Base Year	2005	3,376,844.77	651,101.69
	2006		678,447.97
	2007	975,211.86	706,942.78
	2008		736,634.38
	2009		767,573.02

	Year		
	2010		799,811.09
	2011		833,403.15
Major Invest - Major intervention to increase the LPG storage capacity to 1000 MT	2012	10,010,000.00	868,406.09
	2013		904,879.14
	2014		942,884.07
	2015		982485.196
	2016		1,023,749.58
	2017		1,066,747.06
	2018		1,111,550.43
	2019		1,158,235.55
	2020		1,206,881.44
	2021		1257570.46
	2022		1,310,388.43
	2023		1,365,424.74
	2024		1,422,772.58
	2025		1,482,529.03
	2026		1,544,795.25
	2027		1,609,676.65
Major Invest - Major intervention to increase the LPG storage capacity to 2000 MT	2028		1,677,283.06
	2029		1,747,728.95
	2030		1,821,133.57

Table 2.2.7: Annual IF, O&M and FF for Business As Usual Scenario

	Year	IF (USD)	O&M (USD)	FF (USD)
Base Year	2005	3,376,844.77	651,101.69	1,150,747.60
	2006		678,447.97	1,292,519.70
	2007	975,211.86	706,942.78	1,451,758.13
	2008		736,634.38	1,633,750.53
	2009		767,573.02	1,838,557.50
	2010		799,811.09	2,628,552.68
	2011		833,403.15	2,875,899.49
Major Invest	2012	10,010,000.00	868,406.09	3,146,521.63
	2013		904,879.14	3,442,609.32
	2014		942,884.07	3,766,558.85
	2015		982,485.20	4,120,992.04
	2016		1,023,749.58	4,508,777.39
	2017		1,066,747.06	4,933,053.35
	2018		1,111,550.43	5,397,253.67
	2019		1,158,235.55	5,905,135.24
	2020		1,206,881.44	6,460,808.46
	2021		1,257,570.47	7,068,770.54
	2022		1,310,388.43	7,733,941.85
	2023		1,365,424.74	8,461,705.77
	2024		1,422,772.58	9,257,952.29
	2025		1,482,529.03	10,129,125.60
	2026		1,544,795.25	11,082,276.31
	2027		1,609,676.65	12,125,118.52
Major Invest	2028	10,510,500.00	1,677,283.06	13,266,092.17
	2029		1,747,728.95	14,514,431.44
	2030		1,821,133.57	15,880,239.44

Table 2.4.0: Baseline Scenario: Cumulative Discounted IF, FF, and O&M Estimates, By Investment Type, Investment Entity, and Funding Source

Sources of I&FF Funds		Cumulative Discounted IF, FF, & O&M Estimates for Baseline Scenario (2005US$)											
		Building			Plant & Equipment			Vehicles			All Investment Types		
		IF	FF	O&M Costs	IF	FF	O&M Costs	IF	FF	O&M	IF	FF	O&M Costs
Domestic	Equity and debt												
Total Household Funds (all domestic)													
Domestic	Domestic Equity (including internal cash flow)												
	Domestic borrowing (bonds and loans)												
	Total Domestic Sources	9,943,587.50		14,839,517.68	7,128,936.40								
Foreign	Foreign Direct Investment (FDI)												
	Foreign Borrowing												
	Foreign Aid (ODA)												
	Total Foreign Sources	6,629,058.33			1,002,439.02								
Total Corporation Funds		16,572,645.84		14,839,517.68	8,131,375.42	94,814,691.86	14,839,517.68	168,535.38	45,554,784.68		24,872,556.63	140,369,476.54	29,679,035.35
Domestic	Domestic Funds (Budgetary)												
Foreign	Foreign Borrowing												
	Bilateral foreign aid (bilateral ODA)												
	Multilateral foreign aid (multilateral ODA)												
	Total Foreign Sources												
Total Government Funds						23,703,672.96					0.00	23,703,672.96	0.00
Total IF		16,572,645.84		14,839,517.68	8,131,375.42	118,518,364.82	14,839,517.68	168,535.38	45,554,784.68		24,872,556.63	164,073,149.51	29,679,035.35

2.2.5 Mitigation Scenario

The Gambia, like most African countries depend almost exclusively on the use of traditional biomass to meet its domestic cooking energy need. The consequences of this is the destruction of the natural forest to meet the fuelwood and charcoal needs for the majority of the urban populations that leads to the emission of greenhouse gases.

In an attempt to stem the over-exploitation of the natural forest for domestic energy needs and reduce the emission of GHGs, Government took some steps to reduce this over-dependency on the forest: From the various studies and reports, the following mitigation options for the domestic cooking energy sector were taken:

- Provide fiscal incentives to reduce high consumption by introducing efficient cookstoves;
- Better management of natural resources by giving local populations a stake in sustainably grown forests;
- Diversify fuel substitutions for cooking (including modern biofuels of ethanol, methanol, biogas and bio-diesel) and)
- Use of improved cooking stoves to reduce fuelwood and charcoal consumption.
- Biogas Production: Biogas digesters can be used in rural areas to produce biogas from animal and crop residues for cooking and other access programmes.
- Solar cookers as an alternative to wood and charcoal for cooking.

Based on the options advanced above for prioritizing mitigation options to reduce the very high dependence of domestic user, the mitigation option selected for this sector activity is the widespread utilization of LPG as a cooking fuel substitute.

Investments categories in the I&FF analyses include: (i) buildings, (ii) plants and equipment and (iii) Vehicles. Given that the sector is very small, accounting for less that 2% of the energy balance of the country in 2009, any intervention programme by the Government to promote its widespread use (in addition to other alternative measures employed to reduce the high dependence on fuelwood), requires huge capital investments and operational cost. It is worthy to note that these categories cover both the bulk importer and the dealers in general.

(i)   Buildings: Investments in this category include construction and maintenance of warehouses and other physical structures for offices and proper storage of equipment and plants for safe and efficient operation and maintenance. A typical example is that one of the Gas Dealers does not even have a warehouse for the vehicle fleet including the truck tankers and this could be dangerous from safety point of view;

(ii)   Plants and equipment: In this category, all the filling plants and associated infrastructure related to operation in receiving the gas for bulk supply and delivery to dealers and other retailers. It includes large tanks for storage at dealer's site, gas cylinders and burners, filling plants, etc;

(iii) Vehicles: As the name suggests and covers all road transportation and could include a barge as well for efficient supply to the rural areas using the river. This is applicable for taking delivery from the bulk storage depot in large truck tankers to dealers' filling plants in the urban, rural and peri-urban areas and also delivery to various retail outlets.

It is necessary to invest in each of the various investment categories highlighted above between now and 2030. The existing infrastructure for LPG is quite fragile and require boost to withstand the test of time and security.

One of the macro-economic policies of Government is 'private sector lead growth and development'. In this policy framework, the government has put in place some investment incentives to attract private sector investment (both domestic and foreign).

Therefore, in the implementation of this investment plan, the government contribution would include the cost for land, waiver on import duties for heavy machinery and equipment and also that of the fuel. These are subsidy costs that the Government would be investing in addition to tax breaks granted to selected sector companies for selected periods. Promotion and development of LGP would be another campaign the Government would lead to ensure that the message gets through for successful acceptance of the population switching from the use of traditional biomass to LPG.

The rest of the investment is anticipated to be borne by the private sector in terms of constructing additional facilities at the bulk storage facility in terms of bulk storage facilities and also for distribution companies. All the associated facilities that go with the bulk and distribution storage such as refilling plants, fire and safety equipment, warehouses for storage of gas cylinders, garages for vehicles for bulk transportation and distribution and maintenance warehouses. Investments by private sector also include buildings and its maintenance and staffing. The operation and maintenance of all the facilities would certainly be the responsibility of the private investor.

Sources of financing, other than subsidy costs can vary from bilateral to multilateral, development grants and other innovative financing such as carbon credits.

In the past years, the measures adopted resulted in some positive gains in addressing the degradation of the natural forest over the years. The gains in the sector were however eroded over the years by the rapid increasing population, especially in the urban and peri-urban populations in the GBA.

To strengthen the implementation of the policy objective in this mitigation measure, The Government promoted private sector investment to construct a sea terminal and bulk storage facility for petroleum products including LPG.

Prior to the construction of the sea terminal and bulk storage facility, all the gas were imported from outside the country mainly from Senegal using truck tankers. Table: 2.4.4 shows the Mitigation Scenario regarding cumulative Discounted IF, FF, and O&M Estimates, By Investment Type, Investment Entity, and Funding Source.

In the estimation of projections for the Mitigation Scenario for LPG consumption, the following consideration was made:
- Policy and fiscal interventions of Government to reduce very high cost of the LPG. According to the Household Energy Study 2005 (HES 2005), 5% of the population use LPG for cooking, This is not expected to increase without any major policy change. With this major policy shift to promote LPG as a cooking fuel substitute and with major investment in bulk storage facility and sea terminal, the consumption of LPG is projected to increase by 8% annually given the situation of poverty in the country.
- The projections for the investment flow during this period included the following assumptions. Major investments flows are projected based on the capacity needs for expansion of storage facility for LPG. As the consumption picks up with 10% increase, as result of policy interventions, investments have been projected to be made in the following years and with 5% increment after discounting: 2015, 2019, 2022, 2024, and 2026.

Table 2.4.1: Mitigation Scenario FF for LPG Imports

Year	Cons (projected)	Cost/ton (USD)	FF (USD)
2005	1,534.33	750.00	1,150,747.60
2006	1,687.76	810.00	1,367,088.15
2007	1,856.54	874.80	1,624,100.72
2008	2,042.19	944.78	1,929,431.66
2009	2,246.41	1,020.37	2,292,164.81
2010	2,471.05	1,400.00	3,459,475.63
2011	2,718.16	1,470.00	3,995,694.36
2012	2,989.98	1,543.50	4,615,026.98
2013	3,288.97	1,620.68	5,330,356.16
2014	3,617.87	1,701.71	6,156,561.37
2015	3,979.66	1,786.79	7,110,828.38
2016	4,377.62	1,876.13	8,213,006.78
2017	4,815.39	1,969.94	9,486,022.83
2018	5,296.92	2,068.44	10,956,356.37
2019	5,826.62	2,171.86	12,654,591.61
2020	6,409.28	2,280.45	14,616,053.31
2021	7,050.21	2,394.48	16,881,541.57
2022	7,755.23	2,514.20	19,498,180.51
2023	8,530.75	2,639.91	22,520,398.49
2024	9,383.82	2,771.90	26,011,060.26
2025	10,322.21	2,910.50	30,042,774.60
2026	11,354.43	3,056.02	34,699,404.66
2027	12,489.87	3,208.83	40,077,812.38
2028	13,738.86	3,369.27	46,289,873.30
2029	15,112.74	3,537.73	53,464,803.67
2030	16,624.02	3,714.62	61,751,848.23

Table 2.4.2: Mitigation Option (Policy Intervention (10%)) IF & O&M

	Year	IF (USD)	O&M (USD)
Base Year	2005	3,376,844.77	651,101.69
	2006		716,211.86
	2007	975,211.86	787,833.05
	2008		866,616.36
Major Invest - Major intervention to increase the LPG storage capacity to 1000 MT	2009	10,010,000.00	977,277.99
	2010		1,075,005.79
	2011		1,182,506.37

	Year	IF (USD)	FF (USD)
	2012		1,300,757.01
	2013		1,430,832.71
	2014		1,573,915.98
Major Invest - Major intervention to increase the LPG storage capacity to 2000 MT	2015	10,510,500.00	1731307.57
	2016		1904438.33
	2017		2,094,882.17
	2018		2,304,370.38
Major Invest - Major intervention to increase the LPG storage capacity to 3000 MT	2019	11,036,025.00	2,534,807.42
	2020		2,788,288.16
	2021		3067116.98
Major Invest - Major intervention to increase the LPG storage capacity to 4000 MT	2022	11,587,826.25	3,373,828.68
	2023		3,711,211.55
Major Invest	2024	24,334,435.13	4,082,332.70
	2025		4490565.97
Major Invest - Major intervention to increase the LPG storage capacity to 2000 MT	2026	51,102,313.76	4,939,622.57
	2027		5,433,584.82
	2028		5,976,943.30
	2029		6,574,637.63
	2030		7,232,101.40

Table 2.4.3: Annual Mitigation Option (Policy Intervention (10%) IF, FF and O&M

	Year	IF (USD)	O&M (USD)	FF (USD)
Base Year	2005	3,376,844.77	651,101.69	1,150,747.60
	2006		716,211.86	1,367,088.15
	2007	975,211.86	787,833.05	1,624,100.72
	2008		866,616.36	1,929,431.66
Major Invest	2009	10,010,000.00	977,277.99	2,292,164.81
	2010		1,075,005.79	3,459,475.63
	2011		1,182,506.37	3,995,694.36
	2012		1,300,757.01	4,615,026.98
	2013		1,430,832.71	5,330,356.16
	2014		1,573,915.98	6,156,561.37
Major Invest	2015	10,510,500.00	1,731,307.58	7,110,828.38
	2016		1,904,438.33	8,213,006.78
	2017		2,094,882.17	9,486,022.83
	2018		2,304,370.38	10,956,356.37
Major Invest	2019	11,036,025.00	2,534,807.42	12,654,591.61
	2020		2,788,288.16	14,616,053.31

	2021		3,067,116.98	16,881,541.57
Major Invest	2022	11,587,826.25	3,373,828.68	19,498,180.51
	2023		3,711,211.55	22,520,398.49
Major Invest	2024	24,334,435.13	4,082,332.70	26,011,060.26
	2025		4,490,565.97	30,042,774.60
Major Invest	2026	51,102,313.76	4,939,622.57	34,699,404.66
	2027		5,433,584.83	40,077,812.38
	2028		5,976,943.31	46,289,873.30
	2029		6,574,637.64	53,464,803.67
	2030		7,232,101.40	61,751,848.23

Table: 2.4.4   Mitigation Scenario: Cumulative Discounted IF, FF, and O&M Estimates, By Investment Type, Investment Entity, and Funding Source

Category of Investment Entity	Sources of I&FF Funds		Cumulative Discounted IF, FF, & O&M Estimates for Mitigation Scenario (2005US$)											
			Building			Plant & Equipment			Vehicles			All Investment Types		
			IF	FF	O&M Costs	IF	FF	O&M Costs	IF	FF	O&M	IF	FF	O&M Costs
Households	Domestic	Equity and debt												
	Total Household Funds (all domestic)													
Corporations	Domestic	Domestic Equity (including internal cash flow)												
		Domestic borrowing (bonds and loans)												
		Total Domestic Sources												
	Foreign	Foreign Direct Investment (FDI)												
		Foreign Borrowing												
		Foreign Aid (ODA)												
		Total Foreign Sources												
	Total Corporation Funds		81,910,665.59		36,401,049.24	40,189,501.37	257,847,557.27	36,401,049.24	832,989.82	123,885,757.82		122,933,156.77	381,733,315.09	72,802,098.48
Government	Domestic	Domestic Funds (Budgetary)												
	Foreign	Foreign Borrowing												
		Bilateral foreign aid (bilateral ODA)												
		Multilateral foreign aid (multilateral ODA)												
		Total Foreign Sources												
	Total Government Funds						64,461,889.32						64,461,889.32	
	Total IF		81,910,665.59		36,401,049.24	40,189,501.37	322,309,446.59	36,401,049.24	832,989.82	123,885,757.82		122,933,156.77	446,195,204.40	72,802,098.48

3. Results

3.1 Incremental Changes in IF, FF, O&M Costs, and Subsidy Costs

Year	Investment Flow (USD)			Financial Flow (USD)			O&M		
	Miti IF	Baseline IF	Increment	Miti FF	Baseline FF	Increment	Miti O&M	Baseline O&M	Increment
2005	3,376,844.77	3,376,844.77	-	1,150,747.60	1,150,747.60	-	651,101.69	651,101.69	-
2006			-	1,367,088.15	1,292,519.70	74,568.44	716,211.86	678,447.97	37,763.90
2007	975,211.86	975,211.86	-	1,624,100.72	1,451,758.13	172,342.59	787,833.05	706,942.78	80,890.27
2008			-	1,929,431.66	1,633,750.53	295,681.13	866,616.36	736,634.38	129,981.98
2009	10,010,000.00		10,010,000.00	2,292,164.81	1,838,557.50	453,607.31	977,277.99	767,573.02	209,704.97
2010			-	3,459,475.63	2,628,552.68	830,922.95	1,075,005.79	799,811.09	275,194.70
2011			-	3,995,694.36	2,875,899.49	1,119,794.87	1,182,506.37	833,403.15	349,103.22
2012		10,010,000.00	-10,010,000.00	4,615,026.98	3,146,521.63	1,468,505.35	1,300,757.01	868,406.09	432,350.92
2013			-	5,330,356.16	3,442,609.32	1,887,746.85	1,430,832.71	904,879.14	525,953.57
2014			-	6,156,561.37	3,766,558.85	2,390,002.52	1,573,915.98	942,884.07	631,031.91
2015	10,510,500.00		10,510,500.00	7,110,828.38	4,120,992.04	2,989,836.34	1,731,307.58	982,485.20	748,822.38
2016			-	8,213,006.78	4,508,777.39	3,704,229.39	1,904,438.33	1,023,749.58	880,688.76
2017			-	9,486,022.83	4,933,053.35	4,552,969.49	2,094,882.17	1,066,747.06	1,028,135.11
2018			-	10,956,356.37	5,397,253.67	5,559,102.70	2,304,370.38	1,111,550.43	1,192,819.95
2019	11,036,025.00		11,036,025.00	12,654,591.61	5,905,135.24	6,749,456.37	2,534,807.42	1,158,235.55	1,376,571.87
2020			-	14,616,053.31	6,460,808.46	8,155,244.85	2,788,288.16	1,206,881.44	1,581,406.72
2021			-	16,881,541.57	7,068,770.54	9,812,771.03	3,067,116.98	1,257,570.47	1,809,546.51
2022	11,587,826.25		11,587,826.25	19,498,180.51	7,733,941.85	11,764,238.67	3,373,828.68	1,310,388.43	2,063,440.25
2023			-	22,520,398.49	8,461,705.77	14,058,692.72	3,711,211.55	1,365,424.74	2,345,786.81
2024	24,334,435.13		24,334,435.13	26,011,060.26	9,257,952.29	16,753,107.97	4,082,332.70	1,422,772.58	2,659,560.12
2025			-	30,042,774.60	10,129,125.60	19,913,649.00	4,490,565.97	1,482,529.03	3,008,036.94
2026	51,102,313.76		51,102,313.76	34,699,404.66	11,082,276.31	23,617,128.35	4,939,622.57	1,544,795.25	3,394,827.32
2027			-	40,077,812.38	12,125,118.52	27,952,693.87	5,433,584.83	1,609,676.65	3,823,908.18
2028		10,510,500.00	-10,510,500.00	46,289,873.30	13,266,092.17	33,023,781.14	5,976,943.31	1,677,283.06	4,299,660.24
2029			-	53,464,803.67	14,514,431.44	38,950,372.22	6,574,637.64	1,747,728.95	4,826,908.68
2030			-	61,751,848.23	15,880,239.44	45,871,608.79	7,232,101.40	1,821,133.57	5,410,967.83
Cumulative	122,933,156.77	24,872,556.63	98,060,600.14	446,195,204.40	164,073,149.51	282,122,054.90	72,802,098.48	29,679,035.35	43,123,063.13

Note: negative values mean net savings

Table: Incremental Cumulative Discounted IF & FF Estimates, By Investment Type, Investment Entity, and Funding Source

Category of Investment Entity	Sources of I&FF Funds		Cumulative Discounted IF, FF, & O&M Estimates for Incremental Scenario (2005US$)											
			Building			Plant & Equipment			Vehicles			All Investment Types		
			IF	FF	O&M	IF	FF	O&M	IF	FF	O&M	IF	FF	O&M
Households	Domestic	Equity and debt												
	Total Household Funds (all domestic)													
Corporations	Domestic	Domestic Equity (including internal cash flow)												
		Domestic borrowing (bonds and loans)												
		Total Domestic Sources												
	Foreign	Foreign Direct Investment (FDI)												
		Foreign Borrowing												
		Foreign Aid (ODA)												
		Total Foreign Sources												
	Total Corporation Funds		65,338,019.75		21561531.56	32,058,125.95	163,032,865.41	21,561,531.56	664,454.44	78,330,973.13		98,060,600.14	241,363,838.55	43,123,063.13
Government	Domestic	Domestic Funds (Budgetary)												
	Foreign	Foreign Borrowing												
		Bilateral foreign aid (bilateral ODA)												
		Multilateral foreign aid (multilateral ODA)												
		Total Foreign Sources												
	Total Government Funds					40,758,216.35							40,758,216.35	
Total			65,338,019.75		21,561,531.56	32,058,125.95	203,791,081.77	21,561,531.56	664,454.44	78,330,973.13		98,060,600.14	282,122,054.90	43,123,063.13

With an annual projection increment of 8% in the consumption of LPG in the mitigation scenario, as a result of government policy interventions and increase in population, certainly, there is evidence for a need to increase the capacity of LPG storage facility to match with the increased demand.

Major investment shifts in I&FF are needed for expansion of LPG storage facilities. Additional ton of storage capacity is needed anytime the demand is double or almost double the capacity of the storage facility. Operation and Maintenance expenses increased as LPG business expand. Based on the projection for the mitigation scenario, additional metric ton capacity will be needed in 2015, 2019, 2022, 2024 and 2026.

In the baseline scenario, the use of LPG for cooking is not expected to increase beyond 5% and therefore major investment on bulk storage facility is projected in 2012 and 2028.

With the policy objective of private sector led growth, corporate entities are expected to be major investors and not government. The government intervention will focus mostly on creating enabling policy environment to attract private investment in order to sustain the supply and increasing LPG demand to reduce the dependence on the environment.

3.2 Policy Implications

There is huge difference between the IF, FF and O&M for both the baseline and mitigation scenarios, as depicted in the incremental costs for the annual variations. Overall cumulative invests and incremental costs are positive and huge. These require adequate attention and action in order to achieve the state policy objectives.

The following outline the concrete steps that need to be undertaken and reinforced:

➢ Elaborate and strengthen the policy that promotes the widespread use of LPG with development of a legal and regulatory framework to enhance and develop among other things standards, safety, enabled market environment for private sector participation and consumer participation and confidence.
➢ Conduct education and sensitization campaign for safe and efficient utilization of LPG.
➢ Conduct widespread sensitization in urban and peri-urban areas for greater awareness, understanding and adoption in the use of LPG as a cooking fuel in order to achieve the targeted percentage of population use and save the environment.
➢ Introduce further fiscal incentives such as complete tax exemption to further reduce high cost of the gas particularly for the ordinary people to increase the demand and thereby reducing dependency on forest resources.
➢ Introduce other incentives that that provide tax breaks to companies and businesses to create additional favourable investment climate and thereby increase supply of LPG and make the price affordable.
➢ Explore innovative financing schemes such as carbon funds, that would cushion the high infrastructure investment costs since LPG is a clean cooking fuel substitute by introducing measures that would make the cost of affordable through investment incentives.
➢ Introduce security stock of LPG to ensure sustainable supply of the gas and avoid shortage, increase sensitization campaign to the mass population to switch to LPG as a cooking fuel and save the environment in order to achieve the targeted percentage of population use.

- ➢ Introduce clean fuels levy on traditional biomass from the supply side so as to make LPG competitive and use this levy also to support the sensitization campaign and the supply price.
- ➢ Encourage private sector investments for the LPG sector in the expansion of infrastructure, procurement of the fuel and supply/manufacture of components and parts as a form of encouragement and incentive/guarantee.

The assessment chooses LPG as an alternative clean cooking fuel and not for other operations such as Electricity generated, where all the electricity generated in the country come mainly from fossil fuel. There switching to LPG for domestic energy is more practical and is completely a different issue with power generation using LPG. The policy is on domestic fuels substitution and these are logically explained in this report, arriving at the decision on promoting LPG.

There was no action on analysing GHG emission reductions to confirm if LPG is really the most efficient measure to pursue. It would however be a good measure but the GHG figures were the initial basis for preselecting the domestic energy sector. Further studies to ascertain LPG as the most efficient measure cannot be covered under the scope of this study.

3.3 Key Uncertainties and Methodological Limitations

In conducting the analyses, the methodologies include the major limitations of the availability of the data and hence the estimate for data on investment, O&M and FF. As indicated earlier, it was one of the gas dealers involved in the distribution market who cooperated with the Energy team to provide the data after several months of efforts. Based on the data provided from this company, the assumptions were made and projections calculated based on the only data that was available. From the overall national LPG data collected from the bulk importer and supplier of LPG, this company accounts for about 37.5% of the LPG distribution market.

Other data availability posed the same problem as there continues to be anxiety within the business community about the issue of confidentiality and taxation. Therefore, a better mechanism needs to be in place to assure the business community.

References

Energy Division/ CILSS, 2005: Report Household Energy Strategy For The Gambia (HES) by Development Management Consultants International (DMCI) for the 8th EDF Supported Regional Programme for the Promotion of Household Energies in the Sahel (PREDAS), Banjul, The Gambia.

The Government of The Gambia, 1998: Forest Bill, 1998.

Energy Survey and Master Plan Report, 1982: - Draft Final Report, Banjul, The Gambia.

Report of the Study on The Feasibility of Producing Charcoal Briquettes In The Gambia.

National Energy Policy 2005, Part I – Overview of the Situation and Part II – Policies and Strategies. Submitted to the Energy Division, Office of the President, Banjul by Sahel Invest Ltd.

National Energy Data, 2009. Energy Department, Ministry of Energy.

Final Report on a National Household Energy Consumption Survey in The Gambia, 2005. Conducted by Management Development International (DMCI) for the 8th EDF supported Regional Programme for the Promotion of Household Energy in The Sahel (PREDAS) for the Energy Division, Office of the President.

The Gambia -The Second Strategy for Poverty Alleviation (SPAII). Poverty Reduction Strategy Paper (2003 – 2005), Department of State for Finance and Economic Affairs.

Methodology Guidebook for the Assessment of Investment and Financial Flows to Address Climate Change Version 1.0, 1 July 2009 – UNDP.

Reporting Guidelines for the Assessment of Investment and Financial Flows to Address Climate Change Version 1.0, 1 July 2009 – UNDP.