IGAD Household Energy Project

Country Energy Status, Resource and Stakeholders' Report
Kenya

Country and climate

Kenya occupies some 590 thousand square miles of eastern Africa, bisected by the Equator and bordered by five countries and the Indian Ocean. Its terrain is diverse, with coastal plains, savannah and grasslands, flat semi-desert, lakes and strikingly rugged and arid countryside. With this diversity of landforms come large regional climatic variations with temperatures that range from below freezing on the peak of Mt Kenya to as high as 40C in the low-lying northern plains. Rainfall, too, varies widely. Areas of medium to high rainfall account for less than 20% of Kenya's total land mass; the rest is arid and semi-arid lands (ASALs). These brush and scrub lands support most of Kenya's internationally famous and economically important wildlife resource.

Government and people

Kenya is a developing and still largely rural country where only one quarter of the people live in urban areas. Its 29 million population is young; nearly 50% are under 15 and some 60% under 20. This population, with its rich mix of ethnic groups, languages and lifestyles, is growing rapidly and will reach an estimated 37.5 million by 2010.

The bulk of the population is concentrated in the medium to high rainfall areas that support the towns and industry, although these make up only 20% of the total land mass. Only 20% of the population live in the arid lands, which account for four fifths of the total land area. Population density reaches over 300 per square km in some of Kenya's 'high potential' areas (e.g., Central Highlands, Western Kenya, areas of the Rift Valley) and as low as 5 per square km in others (e.g., the north east and Maasailand). In the more productive rainfall areas, agriculture, including agroforestry and dairy farming, is the chief source of income. Tourism is Kenya's greatest foreign exchange earner, and one of its largest employers. Nonetheless, most Kenyans depend upon agriculture, livestock, fishing and forestry for their main livelihood. However, Kenya is rapidly industrialising – it is Eastern Africa's industrial powerhouse, and small and medium enterprises/SMEs generate more employment per year than any other sector of the economy outside agriculture.

Kenya obtained independence in 1963 and is described as a parliamentary democracy. President Arap Moi has held power since 1978, and is both head of state and head of government. Elections are held every 4 years, and government comprises both directly elected representatives and the President's appointees

1. Overview of the political economy:

Kenya is poor in most natural resources, excluding its people and their entrepreneurship. However its renewable energy base is a major source of economic potential, with abundant solar and biomass resources, Africa's most developed geothermal resources, well-developed, but limited hydropower resources, and largely untapped wind resources. Kenya has few minerals. Less than 20% of its landmass is truly arable. Yet Kenya produces more per hectare in its fertile areas than any other place in the world. Kenya claims equal title with Sri Lanka vying for the world's largest tea exporter. After South Africa, it has Africa's most developed tourism industry and infrastructure. Also after South Africa, it has Africa's largest and most rapidly growing horticultural sector – exporting products with a value of nearly £300

million in 1998. Kenya's coffee, tobacco and cotton sectors are healthy, and improving. Market reforms have injected fresh capital into all agricultural sectors, and Kenya's smallholders in the tea, coffee and dairy sectors are among Africa's wealthiest.

Despite major setbacks - the fall-off in tourist activity due to a number of factors (weather, security, changing tastes), and the recent agricultural and infrastructural havoc wrought by El Nino - the Kenyan economy has undergone major economic reforms and structural improvements over the last 5 years. In particular, the removal of virtually all import, price and foreign exchange controls have opened up the market to competition in every sphere. Kenya's export processing zones have attracted millions of Pounds of investment over the past five years, while its rapidly liberalised economy has led to one of the highest levels of per capita private foreign investment in Africa.

The Kenyan Shilling is virtually convertible. Gross private capital formation has actually accelerated over the past five years, and Kenya is one of a handful of African nations with a small but active stock exchange. Moreover, Kenya has, next to South Africa and Zimbabwe, the continent's most thriving secondary capital market – debentures, mortgages, pensions, bonds and stocks are traded widely, and Kenya's capital markets are well-integrated into the UK's (and South Africa's).
This has resulted in an average annual growth rate in GDP of 3.7% for the period 1993 -1997. In 1997, Kenya's GDP reached some US$ 8.25bn (industry 46.6%, agriculture 24.7%, domestic 14.8% and transport 6%). {Update 98/99]

The last quarter of 1998 saw a crisis in the Kenyan banking sector, particularly for the National Bank of Kenya. However, the Government and the Central Bank of Kenya have injected cash to stabilise the situation and the other main banks; which between them hold 65% of total deposits and earn 75% of the industry profits are in good health. Some of the smaller, less resilient financial institutions are to be helped by a US$ 10 million bailout fund planned by a group of banks. Nonetheless, business confidence in Kenya is high – the Kenya Shilling has retained its value over the past four years, despite last year's banking crisis.

Inflation averaged 9% in 1996, 11.2% in 1997 [???98,99]. This was brought about primarily through weather and its effects on agriculture, on which Kenya depends on so much for its foreign exchange earnings. Inflation is falling, however, and should be below 8% in 1999. Interest rates currently show a downward trend with base rates averaging 18%. The Central Bank is urging a reduced interest rate to facilitate economic growth and encourage borrowers in the money market to bargain for lower rates.

Kenya is classed in World Bank statistics as a low-income economy with an average per capita income standing at US$ 296 in 1997. [98/99???]

- Economic statistics (GDP, GNP, inflation, interest rates, money supply, etc)
- Population statistics showing population and population growth in rural and urban areas should be provided.
- Major economic activities (industry, agriculture, agro-processing, etc.) should be indicated, and special attention should be paid to the household economic (e.g., cottage industry, SME) sector.

Trade

Exports grew at an average rate of about 14% between 1993 and 1997, reaching 1.9 billion US$ in 1997. Food and beverages account for more than half of this figure, with industrial supplies accounting for around 22% and fuels and lubricants for the rest. Kenya has

consistently outperformed most developing countries in its exports. It has diversified into high value crops, and exports these to Europe earning nearly as much from these as from its thriving tea sector (its largest export earner). Kenya is the region's most dynamic economy, and roughly a quarter of all industrial production is exported to neighbouring countries.

Imports in 1997 stood at about US$ 3 billion with non-food industrial supplies, machinery and fuels and lubricants top of the list

Energy Policy

If energy acts or laws have been passed (or are in draft), these should be highlighted (and the texts attached as annexes). If environmental legislation or policies have been put in place (e.g., national environmental action plans), then the areas relevant to energy, particularly household energy, should be highlighted.

Kenya has yet to develop a comprehensive energy policy. However the Electric Power Act 1997 illustrates the increasing openness and liberalism which now characterises energy policy in the country. This new legislation removes the monopoly of the Kenya Power and Light Corporation/KPLC in all fields other than grid operations. If implemented fully, the Act should open up enormous opportunities for independent power producers. Licensees are now able to generate and transmit electricity, and to construct, maintain or operate works for such generation or transmission. The Act does not, however, oblige the utility to buy power from independent producers.

The policy objectives set out for the energy sub-sector underline this movement towards competition and openness. Overall, the aim is to improve investment and operational efficiency in the sector by separating commercial functions from policy setting, regulatory and co-ordinating functions. This will be done by creating more competitive market conditions in electricity generation and in the petroleum sub-sector, by implementing power projects on the basis of least cost investment planning and by restructuring power companies. This will require them to operate on a commercial basis supported by a system of performance contracts and with transparent financial relationships. Further priorities are to adjust the structure of electricity prices to reflect the long-run marginal cost of supply, and to ensure that petroleum prices are set by the market whilst discouraging cartels.

It is also the government's policy to promote efficiency in the supply and use of energy. Specific supply-side measures include reduction of losses in the distribution system and through more efficient generation. On the demand side, large consumers will be encouraged to even-out demand by introducing time-of-use meters and interruptible electricity tariffs. The government will also promote energy audits for industrial and commercial consumers, develop a demand side management programme, promote efficiency standards for electric equipment and encourage private sector participation in the delivery of improvements in energy efficiency. In the near future, a World Bank/GoK Project will conduct a household energy survey to gather recent baseline data for household energy use in the country.

For renewable energy specifically, the government intends to work together with the private sector to promote the economic development of renewable energy sources -particularly to complement energy supplies in areas not served by the grid. Through a tendered World Bank/GoK Project the Government has undertaken to review its policy on import duties and taxes levied on solar power equipment to ensure that they are no higher than those levied on conventional electrical equipment. The same activity intends to establish quality standards for PV equipment.

The Kenya Bureau of Standards is currently coordinating a effort to introduce standards in renewable energy technologies.

1. Overview of the energy situation

Kenya's last national energy supply-demand balance was drawn up in the 1980s, and is clearly out of date. A national energy audit is to be carried out very soon to establish accurate national energy production and consumption figures not presently available.

The main primary source of energy in Kenya is biomass, which provides about 61% of delivered final energy. Over 80% of all households rely on biomass fuels for their domestic needs, about one third in the form of charcoal from the arid and semi-arid lands/ASAL regions, and the rest from the agricultural high-potential areas. Next in importance is imported petroleum, at about 24% of final energy demand. Kenya's well developed, but limited, hydropower resources are next in importance. Kenya has developed its geothermal resources for electricity.

Table : Kenyan Energy Supply

ENERGY BALANCE: '000 TOE	SOLID FUELS	OIL	LARGE HYDRO	RENEWABLES	ELECTRICITY	TOTAL
Primary Production			269	10876		11145
Net imports	58	1966			15	2039
Total Energy Supply	58	1966	269	10876	15	13184
Gross inland consumption	60	1930		7618	282	9890

Source: 1996 energy statistics and balances of non-OECD countries IEA 1998

Update with MoE statistics

Petroleum

The country imports petroleum for domestic use and re-exports the balance to neighbouring countries. Over 20% of the country's foreign exchange earnings are spent on petroleum which provide over 80% of the commercial energy used in the transport, commercial, industrial and agricultural sectors. Oil companies import crude oil for refining at the government-owned refinery in Mombasa. The Kenya Pipeline Company transports refined products to Nairobi, Nakuru, Kisumu and Eldoret, thus covering the most populated areas of the country.

Imports of petroleum and fossil fuels should be defined, with tables and graphs, where possible, with the most up-to-date information on production, supply, imports. [Import from p 146 Economic Survey]

Electricity sector

Table []: Primary fuels input for electricity sector

ELECTRICITY SECTOR DETAILS:	THERMAL (OIL FIRED)	LARGE HYDRO	OTHER RENEWABLES	TOTAL
Installed capacity (MW)	153.5	603.5	45	802
Generation (GWh)	334	3123	290	3747
Fuel inputs for thermal generation ('000 toe)	111			

Source: 1996 energy statistics and balances of non-OECD countries IEA 1998

Kenya has a well-developed electricity sector. The inter-connected system connects all major towns and cities – grid extension was a major priority during the 1980s, and has resulted a firming up of capacity in all major load centres. However, serious planning and forecasting shortfalls during the 1980s have led to major supply shortages – particularly for industrial and commercial consumers. Electricity from the grid provides about 12% of total final energy with less than 250,000 urban consumers, and around 60,000 rural consumers.

Through the 1997 Electric Power Act, Kenya has liberalised and privatised its power sector faster than any country in the region, although implementation is slow. The main utility company, Kenya Power and Light Company/KPLC, is no longer a full state monopoly, although the government owns a controlling share. KPLC now provides only distribution services, and buys power from the three new independent power producers, KenGen, Iberafica and Westmont (K) Ltd. More independent private generating companies are preparing to enter the market. KPLC has the monopoly on distribution and has developed its own network to serve the major centres. The grid covers a large part of the high-density population areas, though the bulk of the population is still not connected.

Total installed electricity generation capacity in 1997 stood at 802MW with hydro contributing 603.5MW, thermal (mainly heavy diesel oil) 153.5MW, geothermal 45MW and imports off-peak power (15 MW???) from Uganda. Perhaps as much as 100MW of independent diesel and petrol capacity has been installed privately over the past decade as both back up and as base load for isolated rural and small urban economic load.

Electricity demand, particularly from commercial and industrial enterprises but also from domestic consumers, has increased steadily since independence, averaging over 9% during the 1960s and 1970s, over 7% during the 1980s, and around 5% over the past decade. Industrialisation, improving standards of living and rising population account for this rapid growth. The Government's goal of industrialisation by the year 2020 is a major driving force in the growth of this sector.

The Government is seeking funds to finance a number of power projects. Agreements have been reached for Olkaria North, East Olkeria II Power Station, and Sondu Miriu. Feasibility studies have been completed for Kipevu II 75 MW diesel project, raising of the Masinga dam and redevelopment of Tana Power Stations (Economic Survey, 1998)

Biomass

of renewable energy production and supply (biomass, hydropower, etc.), and energy for household use (particularly quantities, supplies and prices for such energy sources for households as electricity, kerosene, lpg, etc.).

Energy demand

Table 5: Energy demand by sector

TOTAL FINAL ENERGY DEMAND: '000 TOE	SOLID FUELS	OIL	ELECTRICITY	RENEWABLES	TOTAL
Industrial	6	354	172	528	1060
Transport		1221			1221
Commercial/Tertiary			24	45	69
Domestic	1	166	86	6471	6724
Agriculture		68		573	641
Total	7	1809	282	7617	

Source: 1996 energy statistics and balances of non-OECD countries IEA 1998

1. **Household energy overview:**

Household energy use in Kenya can be broken down by rural/urban tendencies and by income tendencies. In general, urban people have better access to electricity and LPG fuels, while rural people tend to rely on kerosene and wood fuels, though higher income groups are quickly adopting modern technologies. Table [] summarises current household energy applications and how they are met in rural and urban areas. In both rural and urban areas, higher income groups tend to disproportionately spend more money, use a greater variety of appliances and fuels. While middle class has been, in general, quickly taking up more modern energy fuels and appliances, there are also strong indications that the poorer households are using less energy and having to spend more time looking for it.

Table []: Application and Main Appliance/Fuel Used

Application	Urban	Rural	Trends
Lighting.	Grid Electricity Kerosene	Kerosene Solar electricity Grid electricity	
Cooking	TMS & KCJ/Charcoal Burner/LPG Wick Stove/Kerosene Electric Stove/Electricity	Wood Agricultural residues Charcoal	LPG is gaining popularity in both urban and rural areas
Space Heating	Wood Charcoal	Wood	High income urban groups tend to use wood for space heating
Water Heating	Electricity Charcoal	Wood	Urban HHs purchasing Chinese immersion water heaters
Other (e.g., fridges, televisions, radios, etc.)	Radio TV Immersion heaters Electric kettles Irons	TV/Battery/PV systems Radio/dry cells Irons/charcoal Torch/dry cell	Solar electric & battery based systems for TVs sold in large nos

Table []: Penetration Rates for HH Fuels in Kenya (Nyang, 95, (Kenprep, 97)

Fuel	Rural (%)	Urban (%)	National
Kerosene	95.5	92.9	94.7
Firewood	98.7	22.3	73.8
Charcoal	40.4	92.1	57.2
Electricity Grid	~2	49.3	18.6
Electrity Battery Based Solar	~3	N/A	
LPG	3.6	20.3	9.0
Agricultural Residues	70.3	3.8	48.7

Table []: Percentage Distribution of HH by Main Source of Cooking Fuel, by Region and Social Class, 1994 (CBS)

	No	Firewoo	Firewoo	Charcoa	Paraffin	Electrict	Gas/Oth

	(000's)	d (c)	d (p)	l		y	er
Rural Non Poor	2,404	76.7	13.8	5.6	3.3	0.3	0.5
Urban Non-Poor	792	2.8	3.2	28.4	52.0	5	8.6
Rural Poor	1569	90.2	7.8	1.0	0.5	0.3	0.1
Urban Poor	225	14.6	4.7	36.8	41.6	0.8	1.5

c-collected, p-purchased

Table [] Per Capita Annual Consumption of Firewood, Charcoal and Kerosine from Selected Studies

Study	Group	Firewood ('000 kg)	Charcoal ('000s kg)	Kerosene (litres)
Hosier (1985)	**Rural HH**	**0.770**	**0.109**	**8.5**
F.O. Nyang (1995)	**Rural HH**	**0.439**	**0.054**	**7.4**
""	**Urban HH**	**0.462**	**0.105**	**17.7**
""	**Non-Electrified**	**0.449**	**0.070**	**10.4**
""	**Electrified**	**0.470**	**0.071**	**12.4**

Mean Income and Fuel Mix

Fuel Mix	Urban	Rural
Electricity&LPG&kerosene&charcoal	8070	N/A
Electricity&kerosene & charcoal	7660	45060
Kerosene & charcoal	6250	2960
Kerosene & charcoal & firewood	4920	11220
Kerosene & firewood	4250	6190
Firewood	N/A	1425

Source: F.O.Nyang, 1995

LPG for Cooking and Lighting[1]

LPG is playing an increasing role in the market, and it is being taken up by industrial, small business and household customers. Imports of LPG gas rose sevenfold between 1993 and 1997, from 1.6 thousand to 10.9 thousand tonnes. . The current market of LPG gas in Kenya is 27-31,000 metric tonnes per year. Potential achievable market, according to Spectre, is 80,000 tonnes per year (Spectre estimates that they control about 75% of the market). There is current private sector effort to increase existing storage capacity from 2000 metric by about 3000-5000 metric tonnes, with additional storage depots up country

There are now over 700,000 LPG gas bottles in the market. These are locally made by Spectre or imported. This rapid uptake in gas bottles has closely followed efforts by major oil companies to introduce smaller, more affordable gas bottles. Gas bottles

[1] From Israel Agina of Spectre Ltd, Kenya's only producer of LPG bottles and Mr Bango, MD of KUSCCO

are largely used for cooking, though lighting units are available on the market. Typical HH use has been estimated at 7.5-8 kg per month.

Total Oil is the leading LPG supply company. They sell the most bottles, and led the bottle size reduction effort. Currently, the smallest Total bottle size is 7 kg.. Total and Spectre see a wide potential for smaller sizes. At least 3 companies have introduced small bottle sizes (Mobile, Caltex and Total). The lowest cost unit includes a combination canister/cooker, which retails at Kshs 4780.

KUSCCO and Mobil Oil have an active programme to financing 8 kg LPG gas canisters for teachers and KUSCCO clients. Thus far, several thousand canisters have been supplied. Mobil has not been able to supply the demand for canisters. They have more than 10,000 requests, and Mobil does not have stock of canisters. They are supplying at the rate of 1000 per month (canisters come from Portugal).

Gas refills for LPG canisters vary in price between 65 and 70 Kshs per kilo (Jan 2000).

Rural

An estimated 4.1 million families live in rural and village market centers in Kenya. Less than 3% of rural people have access to grid power. 90% of rural HH use two different kerosene and firewood mixtures

Mean energy expenditures were Ksh 434 per month (US$ 8), or about 8% of the typical monthly income. There was considerable variation in energy expenditures; expenditures among the top 25% income group were disproportionally higher than lower income groups . (Kenprep, 1997)

Ag residues

70% of rural HH use ag resideues as fuel, most common is maize cob

Lighting (sources, supplies, appliances)

Lamp Type	Fuel	Cost (Kshs, 2000)	Relative Abundance (Kenprep)	Rural (Nyang)	Urban (Nyang)
Wick	kerosene	100-500	47%	78%	38%
Hurricane	kerosene		58%	80%	92%
Pressure	kerosene	3000	5%	9%	10%
LPG Gas	LPG	2000	<1%		0
Battery or PV-Based			2-3%		
240 VAC (KP&L)			<2%		

Cooking (sources, supplies, appliances)

There is a wide range of cooking appliances available in Kenya.

Cooker Type	Fuel	Cost	Relative	Relative

		(Kshs, Jan 2000)	Abundance Urban* (Nyang)	Abundance Rural* (Nyang)
Wick	kerosene	350-900	85%	76%
Pressure	kerosene	350-900		
Total *Mpishi* (Cooker & Canister combination)	7 kg LPG	4780		
13 kg canister	13 kg	5000		
Gas cooker (1 burner)	LPG	2500		
Gas cooker (2 burner)	LPG	5000		
Gas cooker (4 burner)	LPG	15000		

*of those that use kerosine to cook

	Fuel	Cost (Kshs, Jan 2000)	Relative Abundance Urban* (Nyang)	Relative Abundance Rural* (Nyang)	National (Nyang)
Charcoal Stove Type					
Sheet metal (TMS)	Charcoal	100-500	68	44	60
KCJ	Charcoal	250-800	50.9	21.3	30.9
TMS & KCJ	Charcoal		2.9	10.4	8.0
Others	Charcoal		2.1	0.3	0.9
Firewood Stoves					
3 stone fire	Wood	No cost	83.8	72.1	75.9
Maendeleo jiko	Wood		15.2	9.6	11.4
3SF & Maendeleo	Wood		--	12.1	8.2
Other	Wood		1.0	6.2	4.5

- other (e.g., fridges, televisions, radios, etc.)

Rural Electricity:
There are three methods by which rural people gain access to electricity:
- KP&L Rural Electrification Programme
- Battery Based and Solar PV systems
- Generator sets

The GoK completed a Rural Electrification Masterplan in 1998. [Details of main findings from Theuri].

Rural people who had any type of electricity (i.e. PV, grid, gen-set) were significantly better off than the rest of the population, with incomes between US$ 310 and 1030 per month (Nyang, 95). The same study found that, on average, those that had grid power consumed 83 kWh per month. Demand for electricity, especially to power TV's is high. In the late 1980's and 90's PV and battery-based electric systems have

provided between 200,000 and 300,000 people with household power.[2] It is noteable that all of those who have grid electricity use it for lighting, while only about 75% of those who have PV systems use it for lighting (TV/music system is priority).

Kenya Power and Lighting REP

For rural people, grid electricity is by far the most attractive alternative on a monthly cost basis. However, the Rural Electrification Programme has only been able to reach about 61,500 customers at an average cost of [] per connection. Table [] gives figures on the growth of the programme and average consumption of its clients.

A significant number of wealthy rural households have connected to KP&L power lines outside the subsidised REP paying full costs of lines, transformers and connection. (Numbers?)

Table []: REP Connections, 1993-99

Year	Cumulative Customers	Consumption
	Connections	GWH
93/94	40731	138
94/95	43718	134
95/96	51151	138
96/97	55242	150
97/98	57978	146
98/99	61436	153

Common Rural and Urban Electric Appliances

Appliance Type	Cost	Relative Abundance Rural	Relative Abundance Urban
AVG CONSUMPTION		83 KWH	99.5 KWH
AVG FAMILY INCOMES		$310-1030	$78-650
Television		96%	58%
Irons		52%	75%
Cookers		30%	25%
Refrigerators		19%	22%
Kettles		19%	12%
Geysers		11%	14%

Nyang, 1995

[2] Based on Kenprep figures, battery and PV sales statistics and informal EAA surveys. There are approximately 100,000 PV systems in place in rural HH, and at least as many rural households use lead-acid batteries to power TVs and music systems.

Urban
80% use 4 different kerosene and charcoal based mixture, supplemented with lpg, electricity or firewood.

1. **Household energy fuels:** Good breakdowns of sources of household energy fuels (e.g., woodfuels (wood and charcoal), other biomass, kerosene, electricity (grid, gensets, pv, car batteries) should be provided with statistics on:

- Estimated quantities produced
- Estimated quantities imported
- Import and production costs
- Prices in urban and rural areas
- Taxes, duties, on fuels

Fuel Prices

Fuel Type	**Common Unit**	**Urban Price**	**Rural Price**
Woodfuel			
Charcoal	Sack (50kg)	300 Kshs/sack	
	Tin ()	25 Kshs	
Kerosene	litre	27.56	
LPG	13 kg cylinder	950	
	7 kg cylinder (mpishi)	480	
Electricity:	kWh	5.665*	

* Includes Fuel cost adjustment (80 cents/kWh), forex adjustment (31 cents/kWh), and ERB Levy (3 cents/kWh). Does not include 5% REP levy, No VAT on consumption below 200 kWh/month).

Figure [] shows the relative frequency of various fuel uses and the average expenditures on each. The descending line, starting with kerosene on the left, shows which fuels are most commonly used, while the bars show how much those that use each fuel said they spend each month. Kerosene (called paraffin in Kenya) is used by 96% of the households, predominantly exclusively for lighting, while dry cell batteries are purchased by about 70% of the respondents. Other fuels are all purchased by less than 30% of the population.
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Note that cooking fuels (wood, charcoal and gas) are each purchased by less than 25% of the sample (i.e. the upper quarter of earners). However, this group tends to pay a premium for the fuels. Users of centrally-recharged lead-acid batteries (about 5% of the group) pay an unusually high monthly price for having electric service. This clearly shows an “energy ladder” among consumers, and indicates that, as

households become used to efficiency and quality of life improvements offered by better energy services, they are willing to pay more for them.

1. **Overview of household energy technologies:** The most important household energy appliances and devices should be set out, with their source of origin. Of particular importance are any household energy appliances produced locally (e.g., improved charcoal stoves, kerosene stoves, pv modules, compact flourescent lights, etc.), listing who produces them, the state of development, and trends in development and costs.

2. **Key household energy stakeholders:** A brief overview should be provided of the key private sector, NGO, government and donor stakeholders in the household energy sector, with particular attention to how long they have been active, who they have been working with (particularly commercial actors), and in what fields (e.g. pure energy, or health, or water, or agriculture, etc.)

3. **Overview of renewable energy resources:** Renewable energy resources and technologies are of particular interest to the project. The report should provide brief information on:

- Resource availability
- Resource utilisation
- State of technology development
- Key stakeholders in development, marketing and sales of technologies;

Should be provided for: wood fuel, charcoal, solar thermal (water heating), solar pv, wind, briquettes, agricultural wastes and any other important renewables (e.g., geothermal).

1. **Summary and recommendations:** This should summarise the household energy sector in each country and provide some initial recommendations on how the IGAD programme could and should proceed in working in the sector. Key areas for training, for capacity building, for dissemination and public awareness, for technology development, for pilots, and, most particularly, for assistance for commercial development, should be highlighted.

From the above, a number of conclusions can be drawn:

- Lighting is a priority among rural people, and they will pay more for better sources. This is verified by existing appliances and stated desires.
- Radios and radio cassettes are the second most demanded appliances.
- The majority of the people are willing to pay more for increased convenience. Clearly, even in lower income groups, there is a preference for the more expensive hurricane lantern because of performance improvements. Solar electricity is thus

in demand for reasons of convenience as well as cost. Strict cost comparisons are not valid when comparing items with different convenience values.

- Those that can only afford a wick lamp (<30% of the sample) would not be a likely market as they cannot make the first upward step in energy the "energy ladder" from wick to hurricane lamp.

Given the comparison of the monthly costs of energy for a household which uses a hurricane lamp in combination with a radio, there is a significant potential for SHS in Kenya, as approximately 40% of households falls in this bracket, the appliances already used are especially compatible to PV-systems, and PV systems offers greatly increased levels of service

Key References

KENPREP Report (EAA) : Survey of 1000 HH in 12 Districts analysing market for PV technology

Household Energy Demand and Environmental Management in Kenya, F.O. Nyang, (1999) University of Amsterdam. Data is based on survey of 1200 HH in Homa Bay, Kakamega, Uasin Gishu, Baringo, Laikipia, Embu, Kitui and Kilifi

Economic Survey 1998 (CBS, GoK)

Statistical Abstract `1996 (CBS, GoK)