



Prologue Kenya - Student Debate 3

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Geography & Key Indicators



Latitude -	4°35' N - 4°42' S
Longitude -	34° E - 41°51' E
Time zone -	+3Hrs GMT
Population -	40 million (2011 est.)
Language -	English/Kiswahili
Local languages -	42
Religion -	Christians (83%), Muslims (11.2%)
Literacy -	85.1% (2010)
Life expectancy -	59.5yrs (2011)
Growth rate -	2.9%
GDP (ppp) -	\$1,689 = €1.279 (2010)
Inflation -	18.9% (2011)
Poverty levels -	46.6% (2007)
Energy per capita -	121kWh/yr. (2008)

Land Resource

Element	km ²	Million Ha	%
Total land area	582,650.0	88.2	100
Water mass	13,400.0	1.3	1.5
Landmass	569,250.0	86.9	98.5
<u>Arable land (16%)</u>	91,080.0	13.9	15.8
Farming (31%)	28,234.8	4.3	4.9
Grazing (30%)	27,324.0	4.2	4.7
Forests (22%)	20,037.6	3.1	*3.5
Game parks, urban centres, markets, homesteads, infrastructure (17%)	15,483.6	2.4	2.7
<u>ASALs (84%)</u>	478,170.0	73.0	82.7
Rangeland, agro-pastoralists, pastoralists, reserves ,etc (potential for irrigation)			
Irrigation potential		0.54	0.6
Max irrigation potential (Tana & Athi basins)		1	1.1

Forest Resources

❑ Kenya's forest cover is less than 3% .

❑ Main forest resources are; Mt. Kenya, Aberdares, Arabuko sokoke, Ngangao, Kakamega, Malava, Mau, Elementaita, Ol Doinyo Orok, Karura, Nairobi Arboretum etc.

❑ Benefits; grazing, water, construction materials, energy, medicine, wild food, honey, hunting, tourism, carbon sinks and biodiversity

❑ Pressure on forests is driven by; increasing populations, poverty, demand for agricultural land, energy demand, poor policy formulation and implementation, politics, liberalisation and worsening climate conditions

❑ Charcoal & lumber main cause of deforestation



Agricultural sector

- ❑ Only 16% of the total land is arable
- ❑ About 8% is available for crops and feed
- ❑ 12% of total land is considered high potential, less than 8% medium and over 80% as Arid and Semiarid
- ❑ 75% of agricultural land is in the hands of small scale farmers (0.2-5ha) who lack access to technology.
- ❑ Coffee, tea, sisal, wheat, pineapple and maize are some few crops mainly grown on large scale.
- ❑ Over 5million people live in ASALs and are susceptible to food shortage and often need humanitarian aid.
- ❑ The sector contributes 65% export, 70% informal employment, 18% formal employment, 26% GDP, 25% GDP indirectly
- ❑ Key exports are tea - 23.6%, horticulture - 14.5%, coffee - 3.9%

The energy sector

<p><u>Primary energy</u></p> <ul style="list-style-type: none"> ○ Biomass - 68% ○ Petroleum - 22% ○ Electricity* - 9% ○ Others - 1% 	<p><u>Rural energy mix</u></p> <ul style="list-style-type: none"> ✓ Woodfuel - 89% ✓ Charcoal - 34% ✓ Kerosene - 94% ✓ Nat-gas - 1.8% ✓ Electricity - 6% ✓ Solar - 1% ✓ Biogas ✓ Candles 	<p><u>Urban energy mix</u></p> <ul style="list-style-type: none"> ✓ Woodfuel - 7% ✓ Charcoal - 82% ✓ Kerosene - 89% ✓ Nat-gas - 23% ✓ Electricity - 51% ✓ Candles
<p><u>Capacity</u></p> <ul style="list-style-type: none"> ○ Installed - 1,647MW ○ Nominal - 1,433MW ○ Peak - 1,191MW 	<p><u>Electricity Access</u></p> <ul style="list-style-type: none"> ○ National - 18% ○ Urban - 51% ○ Rural - 6% 	<p><u>Electricity Mix.</u></p> <ul style="list-style-type: none"> ○ Hydro - 57% ○ Thermal - 31.7% ○ Geothermal - 11% ○ Wind - 0.3% ○ Emergency - 286MW

Renewable energy

Commercial level

- Hydro Power - 757MW
- Geothermal - 165MW
- Wind - 5.1MW
- Biomass (sugar bagasse) - 26MW

Domestic level

- Small hydro - Mini-grid installations
- Solar PV - over 40 companies, over 220,000 SHS installed
 - REA installing off-grid units in schools and other centres
- Solar Thermal - over 140,000m² - common in upmarket residentials
- Biogas - over 4,500 domestic size units installed
- Improved cook-stoves - Numerous Institutional and domestic
- Bio-ethanol/-diesel - stoves, lanterns, stationary engines

Biomass Energy

The resource base:

Waste-based

- Exploited - animal manures (household biogas), molasses (ethanol), sugar bagasse* (cogeneration)
- Un-used - Sisal*, coffee, tea, municipal wastes, rice husks, sugar bagasse*, horticultural wastes, wheat straws, molasses*, market wastes, saw dust, abattoir wastes,.

Plant-based

- Exploited - fuelwood and charcoal extensively used
- Un-used* - Prosopis Juliflora (ironwood/
- mesquite), sweet sorghum, water hyacinths, cassava and other liquid biofuels.



* = marginally used currently

*Sample biomass potentials as estimated by GIZ (GTZ)
based on biogas production (2010)*

<i>Type</i>	<i>Solid waste (tonnes)</i>	<i>Liquid waste (m²)</i>	<i>Energy (MW_{el})</i>
Coffee	145,125	4.1m	10
Cut flower	27,357		0.65
Chicken wastes	82,125		1.9
Sisal	735,050	2.46m	20
Sugar	192,705		4.1
Milk processing		1.083m	0.55
1 Pineapple farm	75,000	0.84m	2.35
MSW (Nairobi)	996,450		37.5
1 Distillery stillage		108,000	1.1
1 Meat processing		60.000	0.05
1 pig farm	10,920		0.35
1 tea factory	7,312		0.7

Fuelwood

- ❑ A larger majority of rural population depend on firewood for fuel (89%).
- ❑ In year 2000, consumption was 3,394 kg (rural) and 2,701 kg (urban) per household per annum and per capita consumption was 741 and 691 kg respectively.
- ❑ Kenya experiences a deficit of over 50% of firewood per year
- ❑ Over 20,000 Institutions also use firewood for catering and water heating.
- ❑ Most Tea factories also use fuelwood to run their boilers
- ❑ Other players working with institutions to have woodlots for fuelwood



Charcoal



- An important fuel source for urban dwellers (82%).
- Mature trees are cut and pyrolyzed into high quality carbon fuel
- Main cause of increased deforestation - source of income for rurals.
- Per capita consumption was 156 kg (rural) and 152 kg (urban) - 2000
- Sustainable projects (planting of acacia trees) being implemented in some parts of the country e.g. Bondo (Kisumu), Kitui and Kitengela (Nairobi) areas.
- Energy saving stove - Kenya Ceramic Jiko (KCJ) widely distributed in E. Africa

Bagasse cogeneration

- Annual sugar bagasse production is over 1.8 million tonnes
- Mumias sugar, one of the 9 sugar companies has a 35MW capacity bagasse cogeneration unit. 26MW of the generated electricity is fed to the grid

Biomass electricity

- Some tea companies generate electricity from biomass for internal use
- A company by the name Tower power is almost through with feasibility studies for 2 No., 11.5MW thermal power plants to run on *Prosopis Juliflora* (mesquite / ironwood)
- Vast plantations of this invasive plant, about 200,000ha are found in Baringo, Garissa and Tana river basin.

Briquettes

Kenya Planters Cooperative Union (KPCU), used to produce briquettes 'Kahawa Coal' from coffee husks.

In 2003, Chardust Ltd Kenya, a private Enterprise started briquetting of bagasse in conjunction with Chemelil (a sugar company) and is now producing 5 tonnes/day of Canecoal.

UNIDO recently also started briquetting projects in *Prosopis Juliflora*-invested areas.

A 40kVA briquette-run gasifier drives the screw press



Biogas

- ❑ Biogas use in Kenya is still at domestic level with units averaging from 3 to 15m³
- ❑ The Ministry of Energy promotes and demonstrates biogas technology at its Energy Centres spread out throughout the country.
- ❑ It has in collaboration with JKUAT constructed a 345m³ biogas digester running a 45kW generator and two more others in Maseno and Masinde Muliro Universities
- ❑ The Ministry intends to pilot production of biogas from flower waste to be used to generate electricity for use by flower firms and export to the grid.



❑ Kenya National Federation of Agricultural Producers (KENFAP) is implementing a National Domestic Biogas Programme (KENDBIP) under a the African Biogas Partnership Programme (ABPP) funded by DFIS - Netherlands.



❑ KENDBIP is to be implemented in 4½ years between 2009 and 2013 with an aim to install 8,000 domestic biogas plants

❑ The project gives an investment subsidy of €240. (KES. 25,000) by subsidizing construction costs.



❑ Over 3,000 units were installed by 2011.

❑ United Nations Industrial Development Organization (UNIDO) has implemented medium scale biogas plants using abattoir and agricultural wastes for power generation.

❑ Kilifi plantations also runs a 150kVA biogas power plant run on sisal wastes and animal manures.

❑ Several other projects are being undertaken by other players.

Liquid Biofuels - Bio-ethanol

- Bioethanol in Kenya was considered an alternative energy source in 1970s.
- A power alcohol factory was established in Kisumu to run on surplus molasses from sugar companies in 1978 but was not operationized.
- In 2003, the state owned firm was sold to Spectre International Inc.
- Today, Potable alcohol & industrial methanol is produced for beverage, medical & industrial applications.
- Spectra International (SIL) and Agro-Chemical & Food Company Ltd (ACFC) are the key players producing 22million-lts and 18million-lts respectively per year (2008)
- Plans are underway to produce bioethanol from sweet sorghum and cassava.
- A draft bioethanol policy is already in place and an E10 pilot is yet to start in Kisumu, Eldoret and Nakuru
- A local NGO, PAC (formerly ITDG) is making field trials on stoves

Liquid Biofuels - Biodiesel



- ❑ Biodiesel is currently produced for local consumption mainly on small scale, from jatropha, castor , croton and yellow oreander
- ❑ Most of the main plants existed before consideration as fuel crops and several pilot projects have been established in different areas in the country with over 4.2 million Jatropha seedlings distributed to small/large scale farmers.
- ❑ Key players in jatropha include; Vanilla Development Foundation (1.19m seedlings), Green Africa Foundation (3m seedlings), Magadi Soda Company (10ha), GEF, Policy Innovation Systems for Clean Energy Security (PISCES - policy issues).
- ❑ A draft biodiesel policy is already in place and a Kenya Biodiesel Association formed.

Biomass Energy & Energy Security

- ❑ 68% of population rely on biomass energy and Kenya has not developed her fossil fuel supplies yet
- ❑ Biomass energy feedstock are locally available
- ❑ Engenders independence from fossil sources susceptible to price fluctuations and status of multi/bilateral relations
- ❑ Provides a cheap energy resource to rural communities
- ❑ Value addition of agricultural produce (farm-gate quality)
- ❑ Improves agricultural returns and rural economies
- ❑ Contributes to national energy security by boosting local supplies

Other advantages

- ❑ Curbs excessive use of fossil fertilizer in agriculture
- ❑ Improves soil fertility
- ❑ Improves management of agro-based wastes
- ❑ Reduction of GHGs from fossil fuel emissions
- ❑ Conservation of soils susceptible to erosion
- ❑ Conservation of the forests* and environment

Sustainability concerns on Biomass energy

Sustainable biomass use must address 3 issues; a) ecological credibility, b) social acceptability and c) economic viability.

Use of traditional biomass energy aggravates deforestation threatening soils which leads to siltation of water bodies and eventually distorting the climate. Users of traditional biomass energy are also susceptible to diseases from in-door-air pollution.

Economically-driven new biomass promotes one sustainability pillar but threatens the other two.

Viable ventures seek fertile lands and water only available in high biodiversity areas, wetlands or forests

These same sort regions support larger populations, are designated for food production, cultural and tourism activities and hence their acquisition infringes on these socially accepted applications

Thank you!

Key issues => Floor's open!!