

“Overview of the Energy Sector in the Sub-region”

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Workshop on “Biomass Technology for Sustainable Energy in Western Africa”

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Introduction

- Africa, richly endowed with both fossil fuels and renewable energy resources, but most unexploited, and more than half of fossil fuels produced is exported
- Africa is the least consumer of modern energy in the world.
- For Africa to be competitive it needs substantial energy and not incremental.
- This will call for the development of both its fossil fuel reserves and renewable energy resources.
- Current threat of climate instability and the more recent oil price increases call for development of in renewable energy including biomass energy.

Introduction II

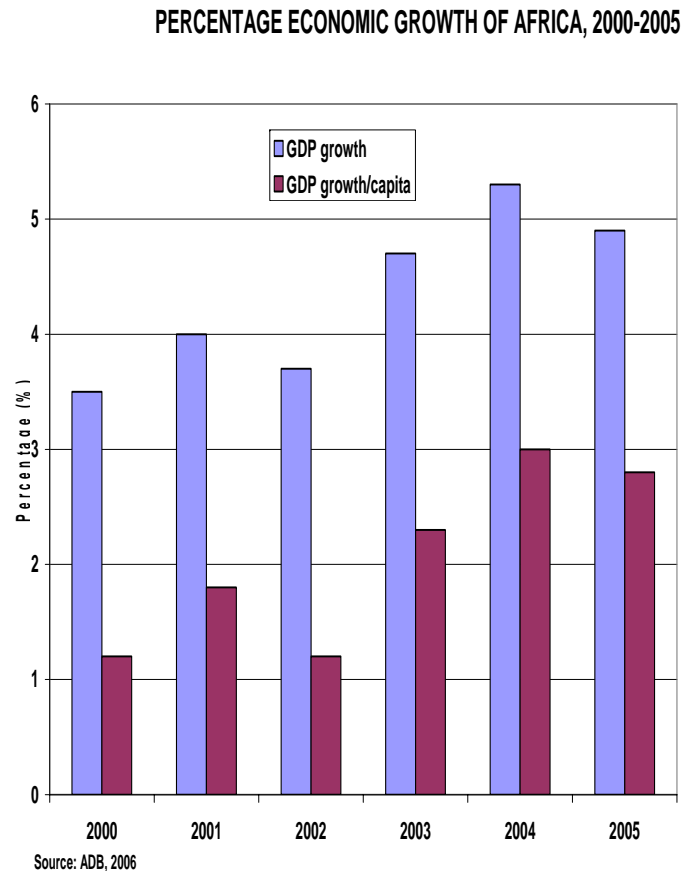
- The production and use of all energy sources can lead to environmental problems.
- Fossil fuel combustion lead to emissions causing local, regional and global problems
- The use of biomass energy also lead to local as well as global environmental problems. Indoor air pollution from cooking with firewood or charcoal in a poorly ventilated area using traditional stoves: respiratory diseases
- The traditional devices used for cooking is a major cause of concern because it is only 15% efficient.
- Particulates and other emissions from biomass burning through bush clearing is also an environmental problem
- Unfortunately, traditional use of biomass energy will continue by the poor, because of its availability, versatility and apparent affordability, though it is not their preferred fuel, but very convenient for poor societies, especially rural areas.

Socio Factors I

- The population growth in West Africa is high in comparison with its productivity.
- The death rate is major concern especially among infants. Out of the 33.2 million births between 2004 and 2005, 13.5 million died of which 1.8 million were infants.
- However, the health status has improved due to increased vaccination against communicable diseases (tuberculoses and measles, but malaria incidence is still high).
- Despite some strides in infrastructural development, but in many countries less than 50% have access to safe drinking water (Mali, Nigeria, Chad, and Sierra Leone).
- However, nearly all countries in the continent started with a very low baseline when they got independence.

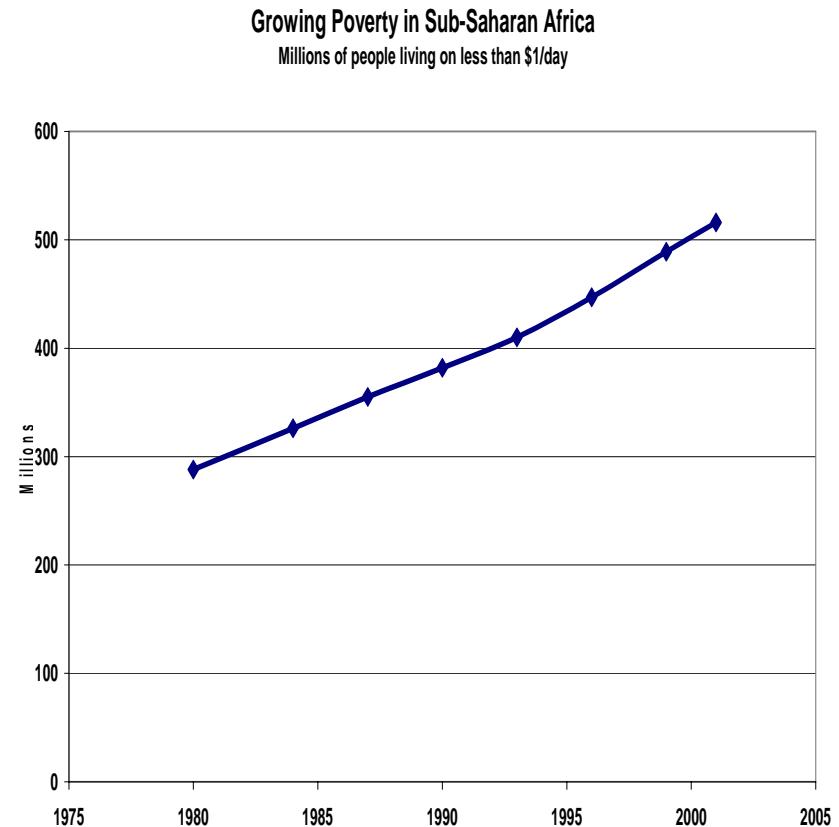
Economy of Africa

- The overall economy of Africa has been growing steadily for the past five years, above 3% annually,
- The economy on per capita grew between 1.2% and 2.8% between 2000 and 2005, while the real GDP was from 3.5% to 4.9% for the same period with over 5 % in 2004
- Further, the gross national income has increased from US\$625 in 2000 to US\$811 in 2005.

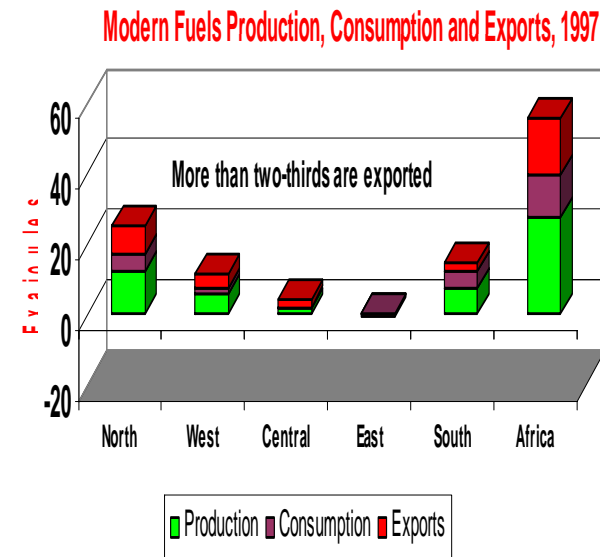
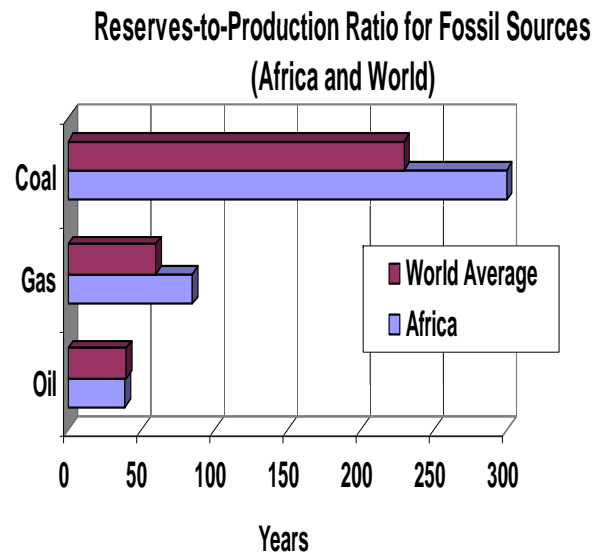


Challenge: Poverty and Inequality

- Growing poverty and inequality within countries in the continent, especially in sub-Saharan Africa.
- Estimates indicated that the number of people living on less than \$1 per day rose from 288 million in 1980 to 516 million in 2001 (UNDESSA, 2006).
- Inequalities is rising (income, human capabilities, access to infrastructure, and decision-making) can lead to conflicts and uprising
- Overcoming poverty and inequalities necessitate that countries be involved in wealth creating activities (energy development, agricultural mechanisation and sustainable industrialisation.
- All these activities demands substantial increase in modern energy



Substantial Energy Resources, but large Share remain unexploited so the least consumer of Modern Energy

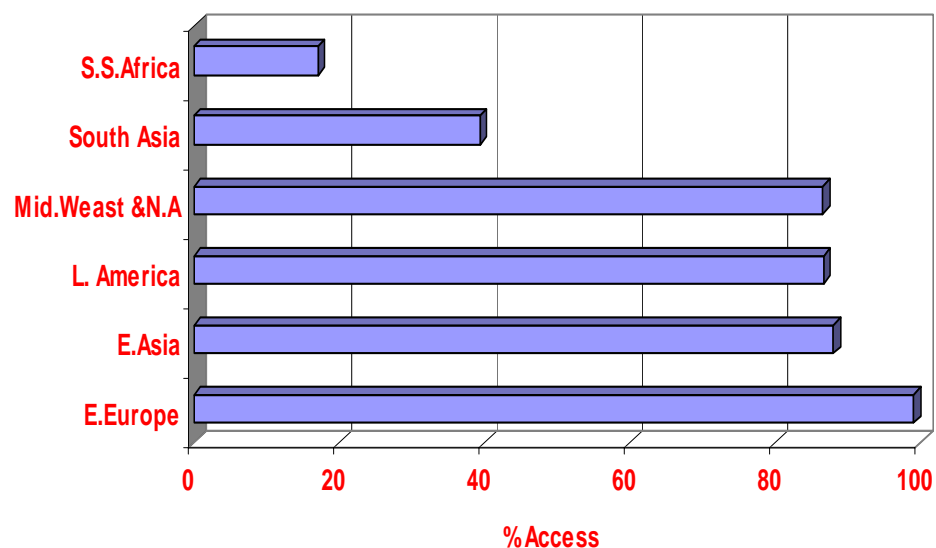


- Africa has 9.5%, 8%, & 5.6% oil, gas and coal resources and significant renewable energy sources, the challenge is to exploit them for the benefit of Africans
- On an average, two-thirds produced is exported
- Energy sources largely skewed: Oil & Gas –West, Coal –South, Hydro& Geothermal-East and biomass and hydro- Central

Electricity Access in West Africa is low

- Electricity is crucial to the overall economic and social development of any region/country, but access in West Africa is the least among developing regions, under 25%
- Average annual consumption lowest in the world, 515 kWh, while world average is 2326 kWh
- Electricity access to rural areas is 9%

Population with Access to Electricity in Developing Regions, 2000



Oil Dependence of Selected West African Countries, 2002

Country	Oil exports as % of GDP	Oil exports as % total exports	Oil exports as % of Government Revenue
Nigeria	40	95	83
Angola	45	90	90
Congo-Brazzaville	67	94	80
Equatorial Guinea	86	90	61
Gabon	73	81	60
Cameroon	4.9	60	20

Source: World Bank, IMF, CIA, US Dept of State, US-EIA

Renewable Energy in Africa

- Hydropower
 - Potential 1,100 TWh, only 7% exploited
 - A quarter in North and West, the other half in East, Central and South
- Geothermal
 - Potential estimated at 2.5-6 GW
 - Exist along the Rift Valley
 - Only Kenya that has exploited up to 129 MW
- Solar
 - Most countries in tropics and good sunshine hours
 - Used extensively as PVs, solar water heaters, etc
- Biomass
- Wind
 - Most countries have poor resource
 - Good areas are coastlines of North and South

Biomass Energy in Africa

- Biomass energy vary by region and country
- Most of biomass used in the West Africa is firewood and charcoal
- Animal waste hardly used in households
- Agricultural waste used mostly in industries

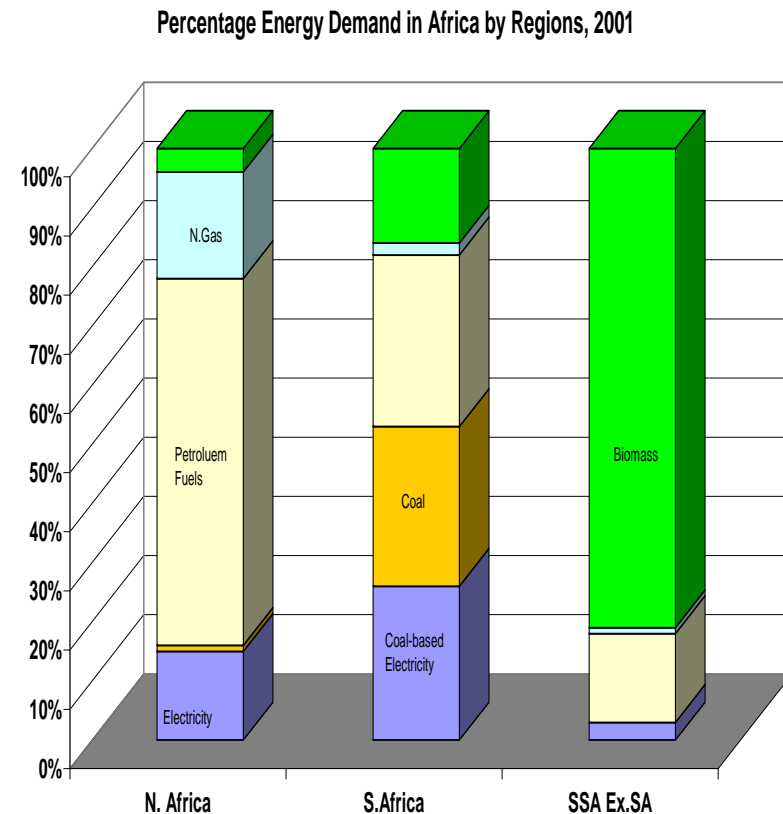


Table 4.1 Biomass Energy in Small-Scale Enterprises

Enterprise	Comment
Beer brewing	25% of fuelwood used Quagadougou: n source fmaior 54% of women in a Tanzanian village. 1kg of firewood/litre of beer
Rice parboiling	1kg wood/0.4kg of rice
Tortilla making	Wood is 25% of bread production costs in Kenya: 0.8-1.5kg wood/kg of bread
Bakeries	60% of cash income for women
Shea butter	40,000 tonnes wood/year in Mopti, Mali
Fish smoking Source: Maduka, 2004	1-5-12kg wood/kg smoked fish, fuel is 40% of processing costs
Palm processing	0.43kg wood/litre of oil; 55% of income of female-headed households in Cameroon

Modern Biomass Energy

- Agricultural and forestry residues in West Africa are a large and under-exploited potential energy resource, and present many opportunities for the energy sector in Africa
- Estimating the production and use of these residues is very difficult. (multiple uses and no common methodology for determining recoverable residue)
- Poor managing and handling of agricultural and forestry wastes can lead to adverse environmental and ecological impacts
- One of the most promising agricultural residues for Africa is from sugar cane.
- Also, forestry residues can be useful with sound forest management, but also difficult to estimate
- Currently, a high proportion of such residues are used to generate energy in these industries, but the potential is considerably greater.
- Energy crops can be produced as dedicated energy crops or as intercropping with non-energy crops, but this is a new concept for the average African farmer. .

Industrial Biomass Use in West Africa

- Nearly all agro-based industries (sugar, palm produce, wood) can use the waste from their industrial processes to produce process heat and electricity, but very few produce energy surpluses which can be sold ex-factory.
- Using modern boilers in these installations can result in producing up to three times more electricity that can be sold to national or community utilities.
- Using by-products from sugar industry, bagasse on a large scale can lead to substantial electricity and heat production. Mauritius is a successful example that has used baggase to meet part of their national electricity needs from its local sugar industry. This industry started production in 1957, and by 1970, was satisfying 16% of the national demand. The country now meets over 16% of its electricity demand
- Large potential exists in many other African countries to use their sugar industries to produce meaningful share of their total electricity supplies

Ethanol Production in Africa

- West Africa has the potential for large scale ethanol as a transport fuel.
- Ethanol can be used as substitute and as an additive to petrol instead of lead
- It is estimated that about 9000 tonnes of lead is used in petrol annually in Africa, and about 2.4 billion litres of ethanol needed to replace lead
- 4 billion litres of ethanol can be obtained from converting all sugarcane available in the continent

Biogas in West Africa

- Biogas production and use is limited in West Africa despite the large potential, only if municipal waste generated is used, especially that such resource is a nuisance .
- Small scale biogas digesters have not as successful in West Africa as it was in other places.
- The relatively few projects in the continent worth noting:
 - Ghana, Appolonia biogas project for R&D,D generates 12.5kW electric power that is fed into a local grid that supplies electricity to 21 houses, for street lighting and five social centres in the nearby community while cow dung and human waste as feedstock.
 - In Malawi, over 14 biogas digesters have been set up at various institutions and households since 1976. The institutional ones prove more successful.
 - One
 - An estimated 256 biogas digesters are installed countrywide in Zimbabwe. They used wastes from different animals wide diffusion for home applications, communities and institutions to be used for cooking and lighting.
 - Some data indicate the existence of between 10 and 1100 biogas digesters in all eastern and central African countries. Examples include biogas projects using human waste as feedstock in prisons in Rwanda and schools and high density slums in Kenya.

Challenges Facing the Biomass Sector

- Environmental
 - Indoor air pollution
 - Contribution to climate change
- Technical
 - Low efficiency
 - Weak industrial attention until recently
 - Poor standards & quality control
- R&D
 - Poor data
 - Poor funding
- Financial
 - High investment cost
 - Poor credit facilities
- Competition with other uses
- Poor supply base

Policy Environment

- Information, education and communication
 - Very poor, little use made of schools and media
 - Poor interaction with community
- Taxes and subsidies
 - Ad hoc decisions
 - Confusion between fuels/appliances
- Regulation and legislation
 - When exist only on more formal systems
 - Biomass mostly ignored
- Financing
 - Out of Bank portfolio
- R&D –Extremely weak in funds and personnel

Small-Scale Projects

- Scaling up high impact biomass projects
 - Improved charcoal kilns
 - Improved commercial use of biomass (bakery, beer brewing, tobacco curing, commercial stoves
 - Development of institutional stoves
 - Replicating the multi-functional platform

Medium-Scale Projects

- Facilitating LPG use in West African cities
 - Develop cylinders and stoves with different sizes
 - Develop a rationale subsidy support programme
 - Develop a well organised distribution system
- Use of alternative household cooking fuels and conversion devices
 - Upgraded kerosene stove
 - Ethanol stove development
- Monitoring household fuel use

Large-Scale Projects

- Retrofitting exist agricultural plants with efficient boilers
- Upgrade sugar plants to produce both electricity and ethanol
- Facilitate the production of bio-fuels using a wide variety of seeds

R&D Projects

- Data collection, organisation and retrieval system
- Develop new varieties for ethanol production
- Use of bio-technology to develop new varieties
- Adaptation of flex-engines to cope with bio-fuels (collaboration with others)
- Develop bio-kerosene (collaboration with others)

Thank You All...