

The Place of Sunlight in African Culture: Traditional Wisdom in the Light of Present Knowledge and Future Requirements

by

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Issues Addressed

- **Broadly define solar energy to include most Renewables Energy Technologies (RETs)**
- **Key features of energy sector in Africa**
- **Status and prospects of RETs**
- **Key challenges facing RETs development in Africa**
- **The role of indigenous knowledge in developing RETs**

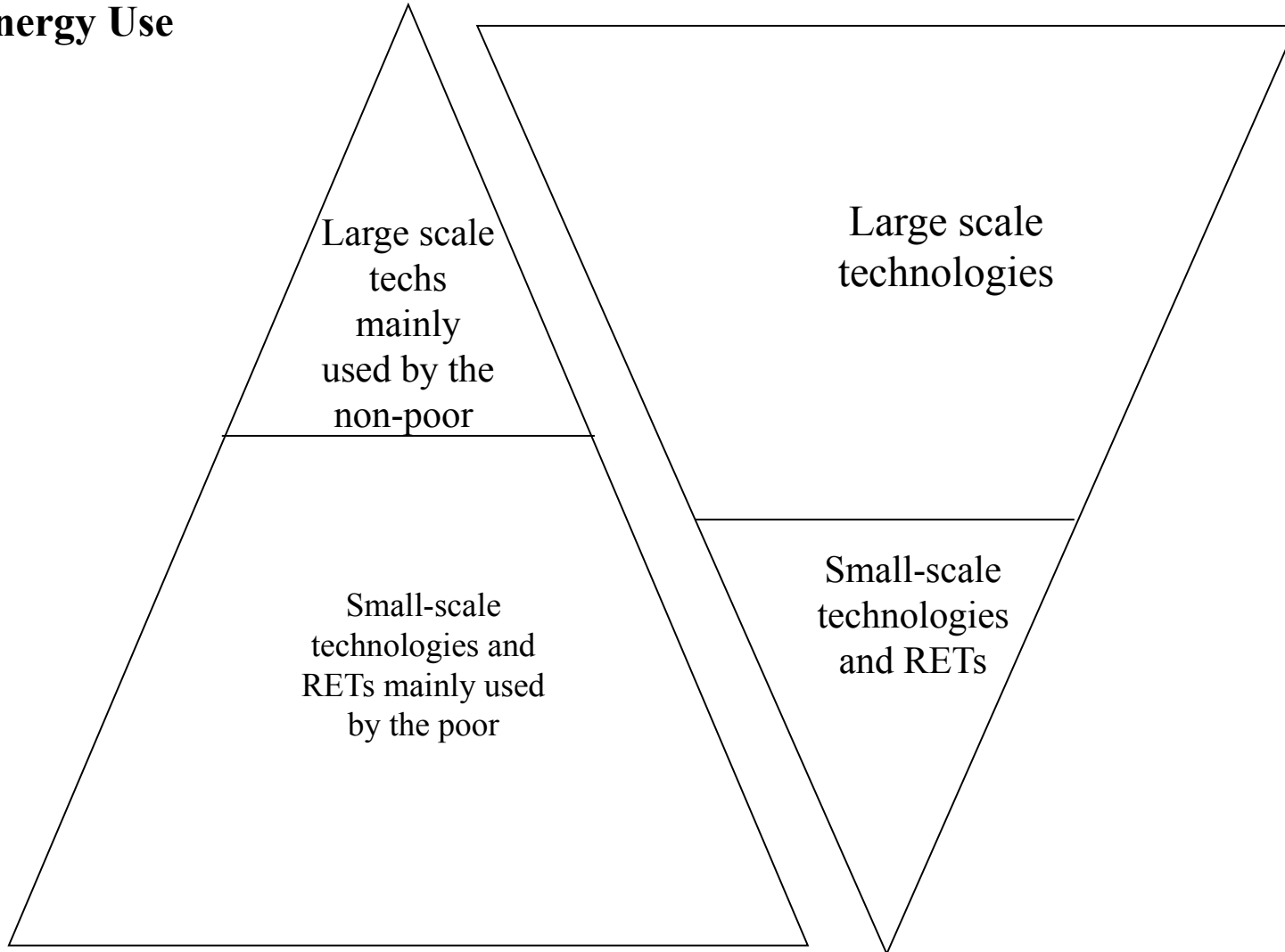
Overview of Africa's Energy Sector

- Energy use in sub-Saharan Africa - dominated by biomass (wood, charcoal, bio residues)
- Low levels of access to modern energy services
- Rich RETs resource base: hydro (small hydro), geothermal, solar, wind and biomass - largely unexploited
- Limited policy interest or investment in RETs - focus on conventional electricity sourced from coal, hydro and oil&gas

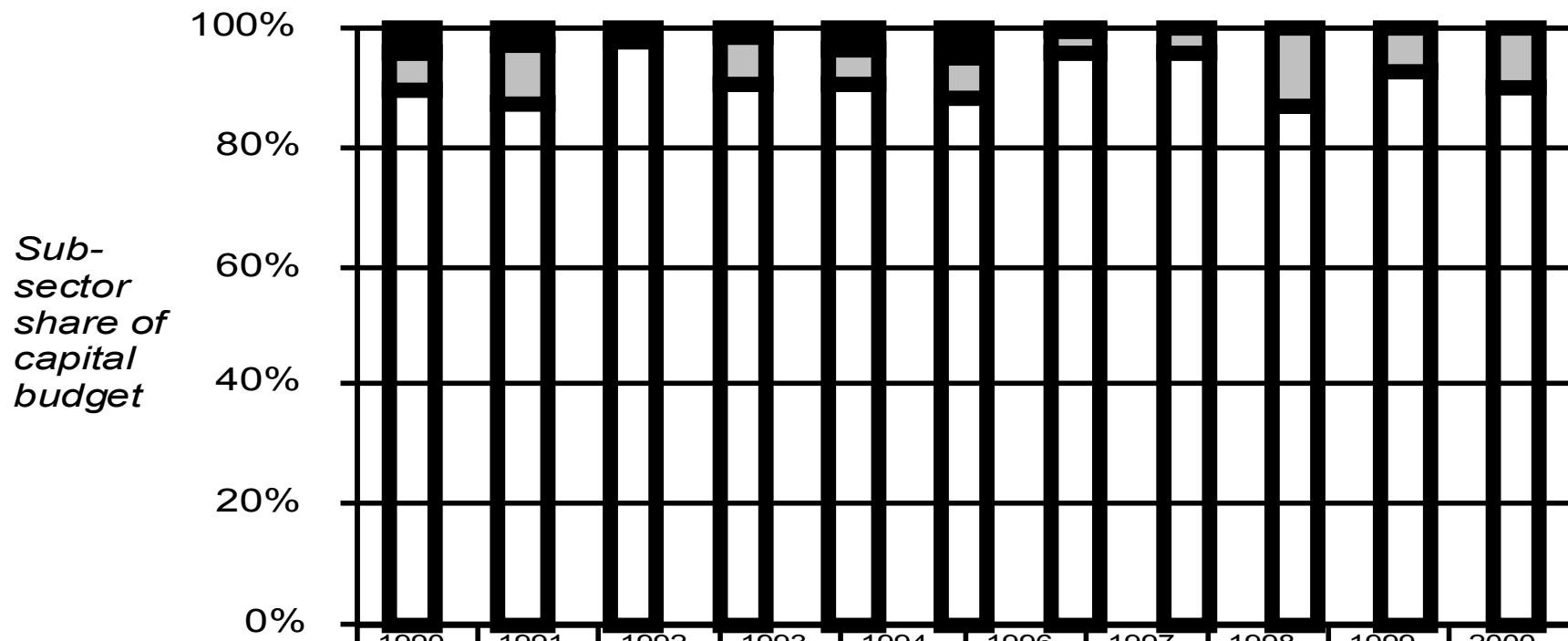
Key Feature of Energy Investment

Energy Use

Energy Investment



Energy sector capital budget shares % and total budget shares in million Birr for Ethiopia, 1990-2000

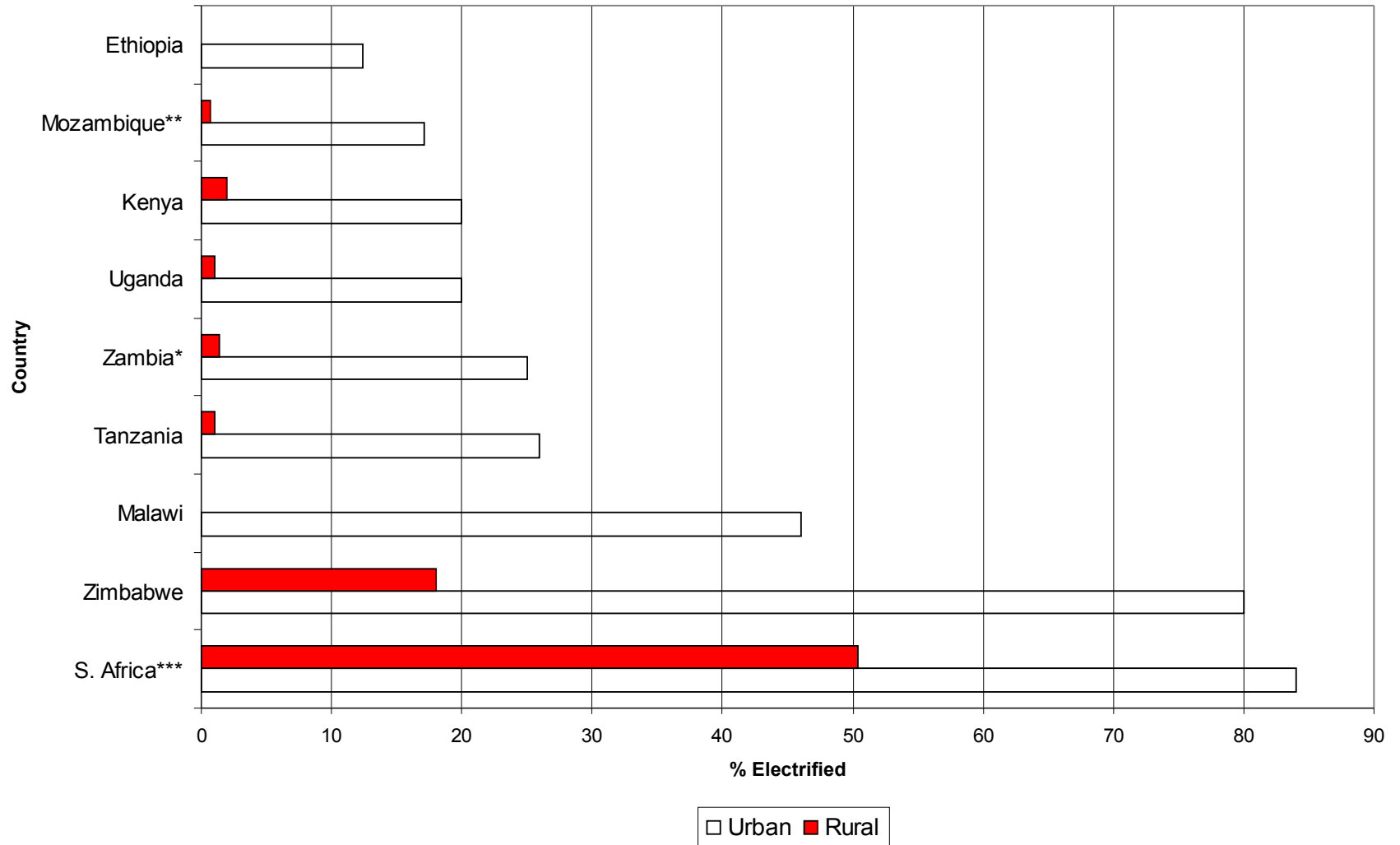


	1990	1991	1992	1993	1994	1996	1997	1998	1999	2000
Traditional and alternative	14.2	5.9	4.0	4.1	10.5	0.7	0.5	0.5	0.4	0.5
Petroleum	21.8	19.8		20.1	16.9	5.5	36.1	81.0	93.2	94.3
Electricity	314.0	182.0	187.0	240.0	267.0	145.0	861.0	539.0	1,209.	886.0

Investment in Large Scale Conventional Energy - Poor Results

- Increased frequency of power deficits
- Fossil fuel imports - shortage of hard currency
- Debt burden due to large investments
- Increased exposure to corruption
- Insignificant impact on income generation and poverty alleviation
- Imported technologies - no opportunities for local independent technology development
- Environmentally unfriendly

Low Electrification Levels



Renewable Energy Resources in Africa

Solar	5-6 kWh/m ²
Wind	3-5 m/s (higher in south & north coastal areas)
Biomass	Extensive
Geothermal	9000MW (not solar-based)
Hydro (Small)	Extensive

Interest in Renewables

- Recurrent power crises (increased outages and rationing) - droughts linked to climate change ?
- Increasing oil prices and shortage of hard currency
- United Nations Conference on Environment and Development (Agenda 21)
- United Nations Framework Convention on Climate Change
- WSSD 2002 - 10% Renewable Energy Target

Status of Renewable Energy Technologies in Africa & Traditional Knowledge

- **Status**
- **Challenges**
- **Actual/potential contribution of traditional knowledge**

Direct Solar Energy Technologies

- **Solar water heaters**
- **Small-scale solar water distillers**
- **Solar dryers**
- **Solar PVs**
- **Large-scale solar thermal-electric**
- **Large-scale solar chimneys**

Domestic Solar Water Heater Installed Capacity

Country	Installed capacity (1000m²)
Botswana	50
Malawi	4.8
Mauritius	40
Namibia	24
Seychelles	2.4
South Africa	500
Zimbabwe	10

Source: DBSA, 1999, Mogotsi, 2000, Mandhlazi, 2000, Mapako, 2000, AFREPREN, 2002

PV Dissemination in Selected sub-Saharan African Countries

Country	Estimated Number of systems	Estimated kWp
Uganda	538	152
Botswana	5,724	286
Zambia	5,000	400
Zimbabwe	84,468	1,689
Kenya	120,000	3,600
South Africa	150,000	11,000

Sources: Nieuwenhout, 1991; Bachou and Otiti, 1994; Diphaha and Burton; 1993; Karekezi and Ranja, 1997, AFREPREN, 2001, Hankins, 2001; DBSA, 1999.

Challenges - Direct Solar Energy

- **Heavy emphasis on solar PV**
 - Σ High costs - unattainable for majority of the population in Africa who are poor (2XGNP/capita equivalent to spending Euro 50-60,000 in Europe)
 - Σ Most of the components imported - Little input from local industries
 - Σ Complex technology not easily grasped by local people
 - Σ Could be useful in community applications - rural dispensaries and schools
- **Limited development of small scale thermal solar energy technologies**

Role of Traditional Wisdom

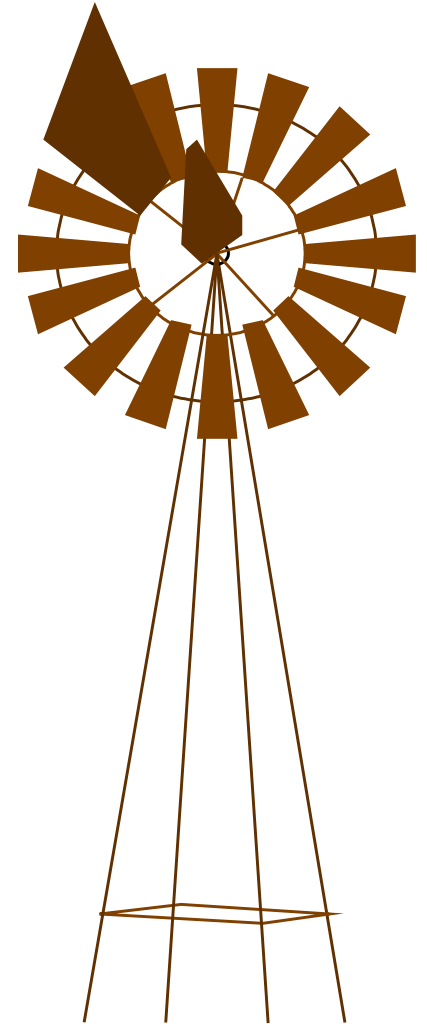
- **Intimate knowledge of solar micro insolation patterns**
- **Instrumental in the development of thermal technologies**
 - Σ Common traditional practice e.g. solar drying
 - Σ Local people can play major part in manufacture, assembly, operation and maintenance of small-scale solar thermal energy technologies

Wind Energy Potential and Number of Wind Pumps for Selected Countries

Country	Potential (m/s)	No. of Windpumps
Botswana	2-3	200
Burundi	>6	1
Djibouti	4	7
Eritrea	3-8	<10
Kenya	3	272
Morocco	Very high (>10)	?
Mozambique	0.7-2.6	50
Namibia	-	30,000
Rwanda	-	-
Seychelles	3.62-6.34	-
South Africa	7.29-9.7	300,000
Sudan	3	12
Tanzania	3	58
Uganda	4	7
Zambia	2.5	100
Zimbabwe	3-4	650

Wind Pumps - Require 3 to 4 m/s

Can work with lower average
windspeeds if local knowledge
& expertise used



Challenges - Wind Energy

- **Inadequate wind energy resource assessment especially at the micro-level**
 - **Role of Traditional Wisdom**
- **Local communities can be instrumental in building a database on micro wind speeds**
- **Over 90% wind pump's components can be manufactured locally by small and medium scale informal sector enterprises (mainly metal fabrication enterprises).**
- **Botswana, Kenya, South Africa, Zambia and Zimbabwe have several well-established manufacturers of wind pumps**

Small-Scale Biomass Technologies

Country	Improved bio-stoves
Kenya	1,450,000
Burkina Faso	200,000
Niger	200,000
Tanzania	54,000
Ethiopia	45,000
Sudan	28,000
Uganda	52,000
Zimbabwe	20,800

Challenges - Small Scale biomass

- **Environmental drawbacks**
 - Σ Deforestation (charcoal production)
 - Σ Indoor air pollution
- **Low levels of improved stoves use in rural areas**

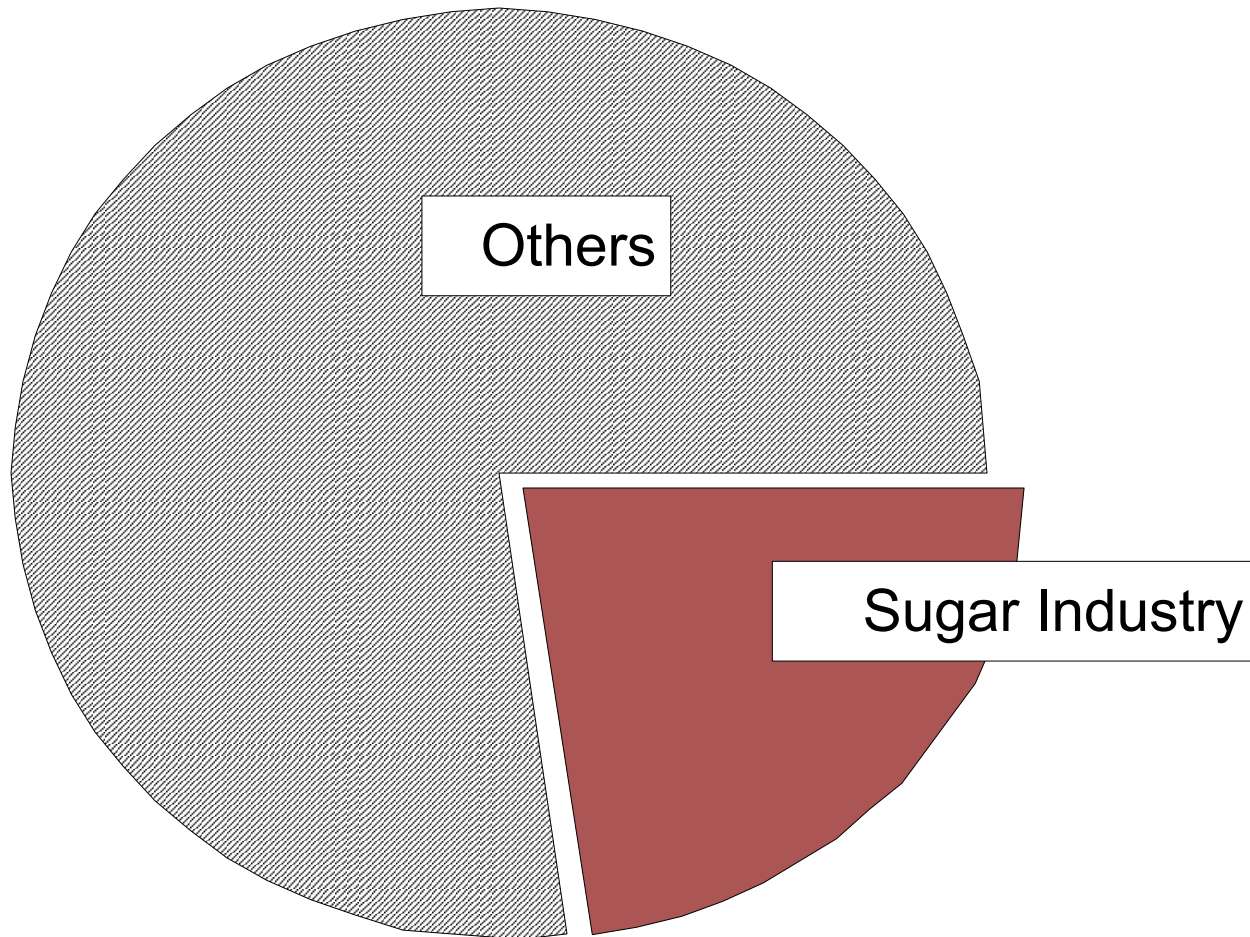
Role of Traditional Wisdom

- **Sustainable use of biomass fuels**
 - Σ Knowledge on fast maturing tree species important for reforestation projects
 - Σ Agro-forestry (combine crop farming with tree planting)
 - Σ Successful agro-forestry experience in semi-arid Eastern Kenya using well developed knowledge of tree husbandry in marginal areas as well as high-potential western Kenya
 - Σ Similar experience in Tanzania and Ethiopia
- **Local manufacture of improved biomass stoves**
 - Σ Uses local knowledge
 - Σ Generates local jobs, enterprises and incomes

Challenges - Large Scale Biomass

- **Integration into existing agro-processing industries**
- **Poor results in Kenya (turnkey large-scale projects, imported technology and local corruption)**
- **Successful example in Mauritius (small & medium scale pilot activities, incremental growth, local knowledge and expertise)**

Large-Scale Biomass Co-generation - Mauritius



Large-Scale Biomass Co-generation - Mauritius

- **Built on local sugar industries (small and large scale)**
- **Exploited local expertise in operation and maintenance of sugar industries**
- **Developed successful revenue-sharing scheme that required intimate knowledge of local and traditional practices and norms**
- **Resulted in broad support (local and policy-level) for co-generation industry**

Small Hydro Power Utilisation

Country	Harnessed (MW)
Uganda*	0.50
Mauritius	6.70
Kenya	6.28
Burundi	5.17
Somalia	4.60
Zambia	4.50
Tanzania	4.00
Lesotho	3.54
Malawi	1.52
Botswana	1.00
Rwanda	1.00
South Africa	0.40
Swaziland	0.30
Mozambique	0.10

* Other stations of total capacity 6.81MW are not operational

Challenges - Small Hydro

- Limited information on potential sites

- **Role of Traditional Wisdom**

- Traditional knowledge on location of streams, rivers and tributaries should be tapped
 - Detailed knowledge of seasonality of water flows
 - Build on existing uses water power e.g. water wheels
 - Nepalese example, where small hydro power developed based on improvement of the traditional “ghatta”

The Way Forward

- **Traditional wisdom instrumental to success of current and future Renewable Energy Technology (RETs) projects**
- **Emphasize small-scale mechanical and thermal RETs - build on local knowledge and small-scale enterprises**
- **De-emphasize renewable electrical technologies - limited local knowledge and capability**
- **De-emphasize large-scale technological complex RETs initiatives**
- **Lessons from unsuccessful large-scale wind machines in Europe & USA**

The Way Forward

- Need for major study linking traditional knowledge & expertise to renewables and charting the way forward
- Compile and collect empirical data on contribution of RETs to development of RETs
- Small study by Heinrich Boll Foundation/AFREPREN on the status of RETs and their contribution to national energy in Eastern Africa partially addressing this issue
- Need to expand this study and launch similar initiatives for other regions of Africa

For More Information

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