Opportunities and barriers to RE in sub-Saharan Africa and a case study of PV electrification in rural Africa

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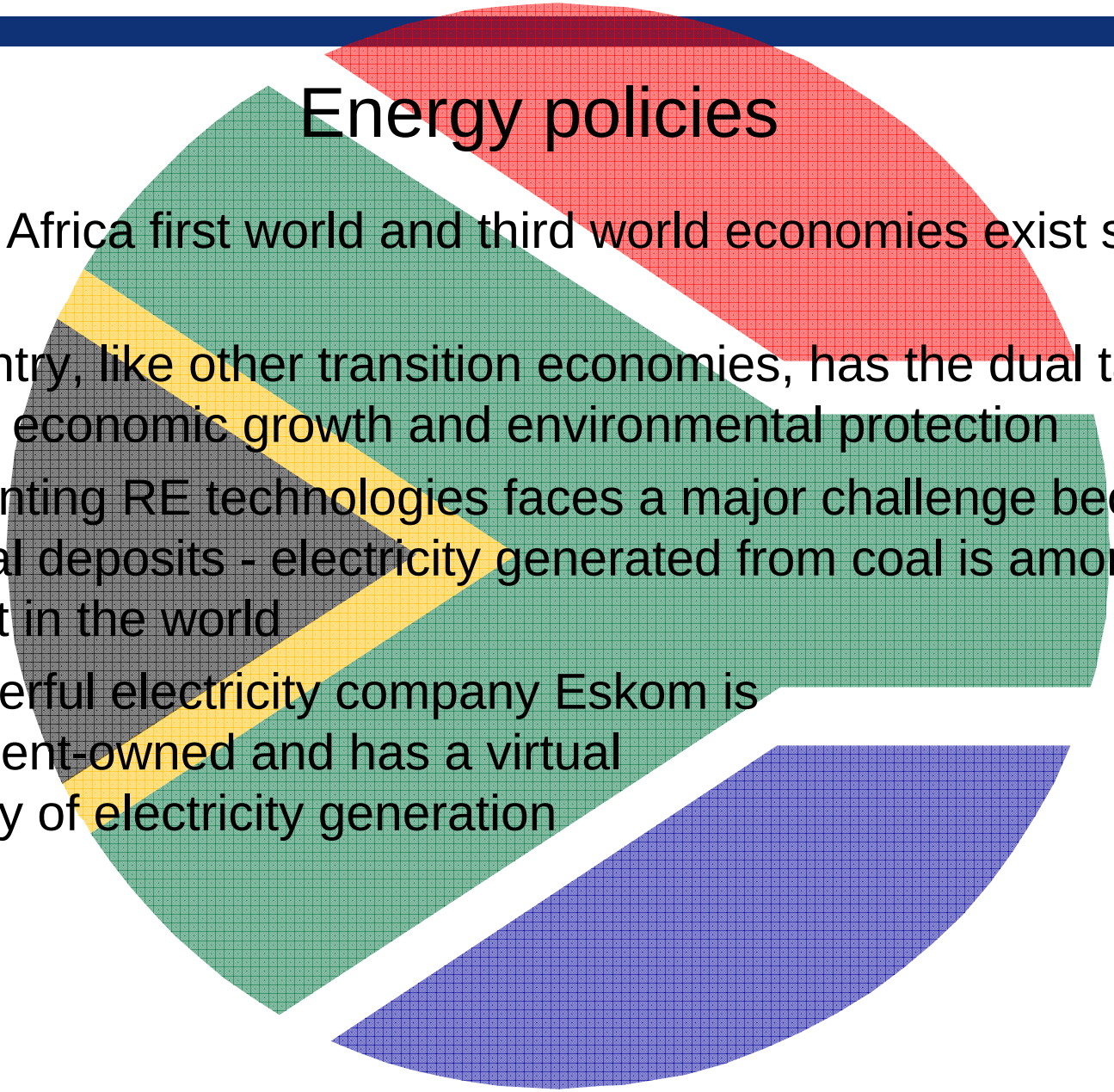
Energy policies

- In South Africa first world and third world economies exist side by side
- The country, like other transition economies, has the dual task of pursuing economic growth and environmental protection
- Implementing RE technologies faces a major challenge because of large coal deposits - electricity generated from coal is amongst the cheapest in the world
- The powerful electricity company Eskom is government-owned and has a virtual monopoly of electricity generation

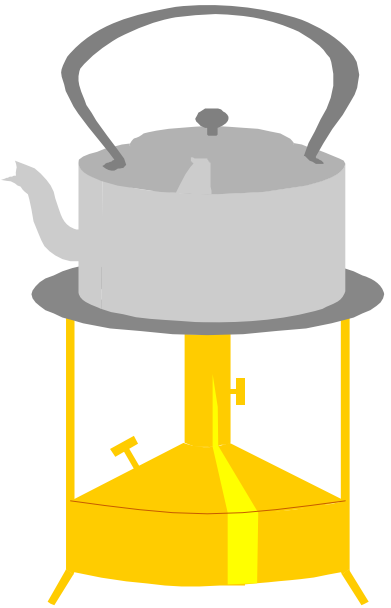


Addressing inequalities in energy access

- South African energy policies have always reflected the political situation
- Pre-democracy (before 1994) energy policy planning was characterised by energy security concerns and racially biased provision of energy
- The new democratic government addressed the inequalities of the past
- Electrification of previously disadvantaged populations was one of the priorities in the Reconstruction and Development Programme (RDP)

National Electrification Programme

- NEP increased electricity coverage from about 36% in 1994 to over 70% in 2002.
- Subsidies mean newly connected customers pay a small fraction of the actual connection cost – about Euro13
- After connection to the grid many poor households could not afford to use the electricity – they continued to cook with kerosene and wood
- Electricity consumption of the new, largely poor customers connected under the NEP remained extremely low and did not cover operation and maintenance cost – contrary to expectations



Free Basic Electricity

- When government realised that the poor did not fully benefit from the large investments in electrification, the Free Basic Electricity Policy was introduced.
- It stipulates that the poor connected to the grid get 50kWh free of charge every month
- This is enough electricity for lighting, B/W TV, radio and occasional basic cooking.
- An equivalent of this subsidy is available for off-grid solar home systems
- Government pays the subsidy to the municipalities

Solar home system in rural South Africa

Solar home systems for remote rural areas

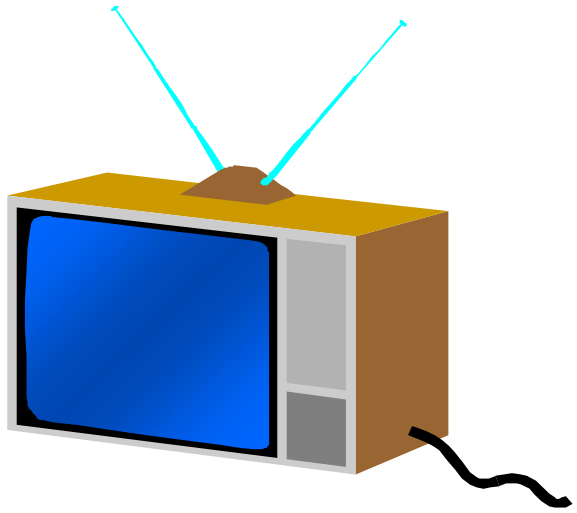
- Extending the grid to every remote household is not feasible for technical and financial reasons
- Decentralised energy supply such as solar home systems is one of the solutions
- A solar concession programme was introduced under which private companies can establish off-grid energy utilities
- The utilities have the exclusive rights to government subsidies to cover most of the capital cost for the next five years
- The utility service provision is a fee-for-service model including the maintenance of the system
- The fee-for-service agreement will last for 20years

Vision – Solar home systems

- Speed up universal access to electricity
- Attract larger, better organised private companies with their own sources of finance
- Facilitate and rationalise electrification planning, funding and subsidisation at national level
- Potential to reduce equipment and service cost through economies of scale
- The utility owning the hardware as assets should facilitate raising of capital on the money markets
- Strong financial and maintenance control should facilitate the channeling of international development funding

Vision - solar home systems (contd)

- Promote other fuels such as kerosene and gas
- Even after electrification rural people tend to continue to rely on multiple fuels
- The solar home system was justified because rural people having access to grid electricity cannot afford higher consumption of electricity
- They tend to use it mainly for lighting, B/W TV and radio, services that can be equally provided by solar home systems
- The service level of the subsidised system is 50 Wp



Actors involved in the SHS programme

- The government implements RDP and wants to fulfil its obligation to provide basic services to historically disadvantaged populations particularly the rural poor
- At the same time it had to set framework conditions and guarantee subsidies to attract private business to participate and take up the concessions
- Off-grid customers and service providers
- As part of the Reconstruction and Development Programme the government Eskom and municipalities as licensed electricity providers for the entire country have to demarcate areas in which the off-grid service provider can operate
- The energy ministry is to facilitate the process, formulate policy and pay the capital subsidy to the service providers
- Electricity regulator approves the installations
- Villagers hope to get access to electricity as well as jobs within the project

What were their expectations?

- Government expected to speed up access to electricity
- The programme targets 300 000 households, 50 000 for each of the initial 6 concession areas
- Service providers were expected to provide gas and kerosene for thermal use

- Providing affordable, safe and clean energy to the rural poor is one of the difficult issues of rural development. Service providers were expecting to prove that their business model is viable and can energise the countryside

Private company speeds up the process

- In1998 Eskom and Shell started a joint venture to provide 50 000 homes with SHSs in the next five years
- Widely publicised and politicised
- Influenced energy ministry to speed up its off-grid electrification programme
- In early 1999 the energy ministry consulted with potential stakeholders, chose the concession model and advertised a call to bid for concessions
- The publicity generated by the Eskom Shell JV created interest in the PV industry and 28 proposals were received. 6 were selected.

Systems and mechanisms of interaction

- Part of the programme was to build capacity and to work out the institutional, legal, contractual and regulatory arrangements for the off-grid energy services
- This took many meetings and extensive negotiations
- It was probably the major reason why the initial phase was very slow

Alignment of interests and issues arising

- Only some of the interests were aligned, eg., government wanted service providers to sell gas and kerosene but only some of the service providers sell these fuels
- The service providers faced major infrastructure problems eg, poor roads, no transport services, no or poor communication
- The lack of basic services increased the cost to the service providers

Issues arising in the early stages

- The absence of basic services makes income generation or small businesses difficult and people find it hard to generate income to pay for their electricity
- These are problems of context and development; they are not related to the of the technology
- The technology is acceptable in areas with very limited basic infrastructure and where no grid electricity has been promised
- People who live in close proximity to the grid or have been promised grid connections often have made up their mind that they don’t want SHSs

From visions to actualities

- In the Eskom-Shell concession the first phase was quickly implemented because there was political pressure towards service delivery to the deprived poor people
- From February 1999 to March 2000 about 6 000 systems were installed
- The company ran into various problems
- Eskom and Shell pulled out and the joint venture was liquidated
- Three smaller companies took over the concession and continued to provide services for some time
- About 20 000 to 30 000 systems have been installed in the four concession areas benefiting about 90 000 people
- The government stopped and delayed paying the capital subsidy to the concessionaires since 2002

Were the initial objectives achieved?

- The roll out of the SHSs was much slower than originally planned
- The initial target was 300 000 systems in five years but only 20 000 to 30 000 were installed to date – 13 years after - because government did not provide the capital subsidy
- Municipalities did not pay the monthly subsidy regularly or in full
- The very poor were excluded because they could not afford the initial installation fee and the monthly service fee
- The hope that the utility model would attract larger companies was not fulfilled
- Only two companies (NuRa and KES (EDF)) with strong foreign backing were attracted
- The expectation that electrification planning, funding and subsidisation would be rationalised was not fulfilled

[1] Systems removed by concessionaire, vandalised, stolen or sold

Concessionaire	Concession areas	Installations up to 2004	Installations up to 2010	Households received grid electricity by 2010	Remaining customers in 2010
Nuon-Raps (NuRa)	Northern Kwa-Zulu Natal	6541	4000		
Solar Vision	Northern Limpopo	4758	11500	4000	6500
Shell-Eskom replaced by the 3 smaller companies below in 2005/6	Northern Eastern Cape and southern Kwa-Zulu Natal	5800	-	-	-
Summer Sun Trading (stopped operating in Feb 2010)			1200		
Ilitha Cooperative			1852	219	1561
Shine the Way no longer operating in 2010 due to financial problems					
KwaZulu Energy Services (KES) EDF-Total	Interior Kwa-Zulu Natal, Eastern Cape since 2005 financed by KdW and DOE	3300	10 000		
Renewable Energy Africa (REA)	Central Eastern Cape	0			
Total		20 399	28 552		

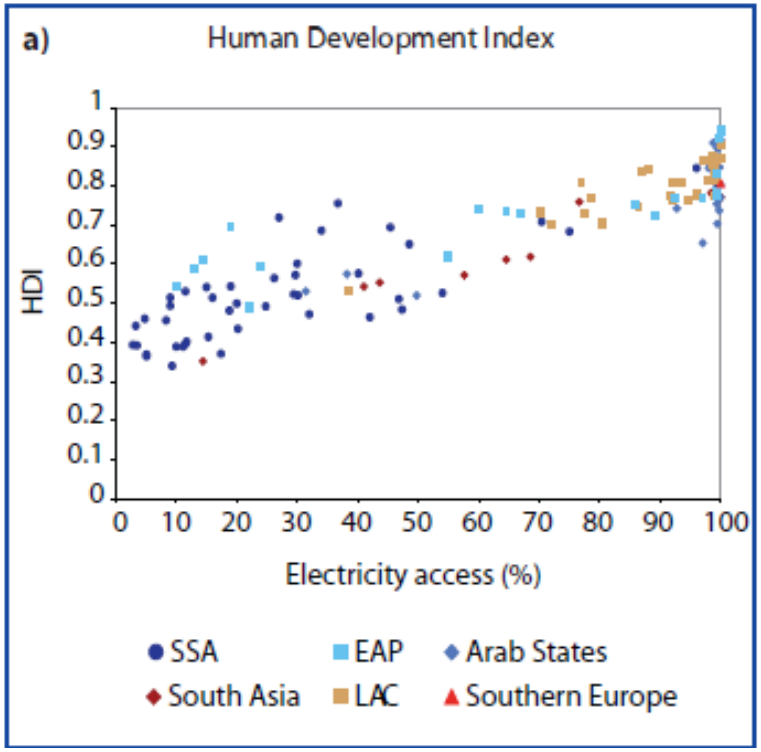
Key lessons

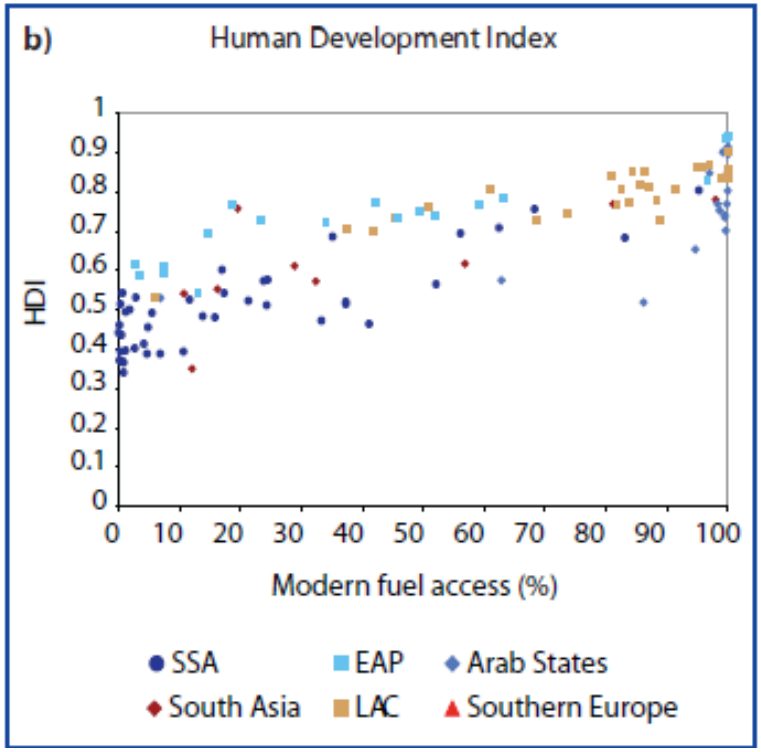
- If the SHSs are not in competition with grid electricity customers accept the technology
- Electricity planning must be transparent and must be communicated to the SHS service providers
- Withdrawal of the capital subsidy threatens programme viability and questions government's commitment to this rural electrification model
- The uncertain payment of service subsidies seriously affects the customers and their ability to pay. Customers had to pay the full service fee - or face repossession of their systems
- The business model for rural energisation must be flexible and adaptable to different and changing situations and challenges

Access to modern energy services in sub-Saharan Africa

- Woodfuels are here to stay in the short to medium term?
- Can we modernise woodfuels?

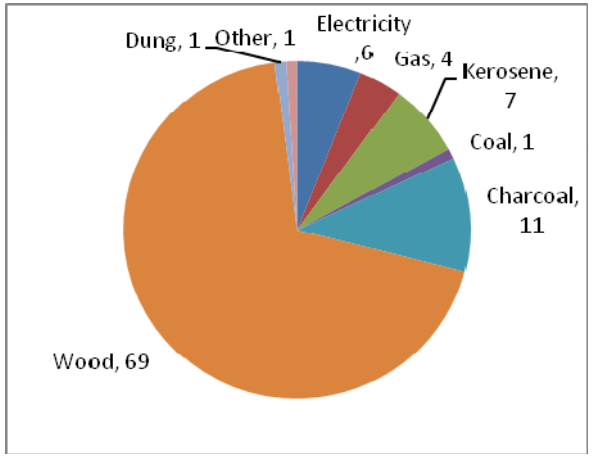
Human Development Index (HDI) and access to modern energy services





Energy for cooking in sub-Saharan Africa

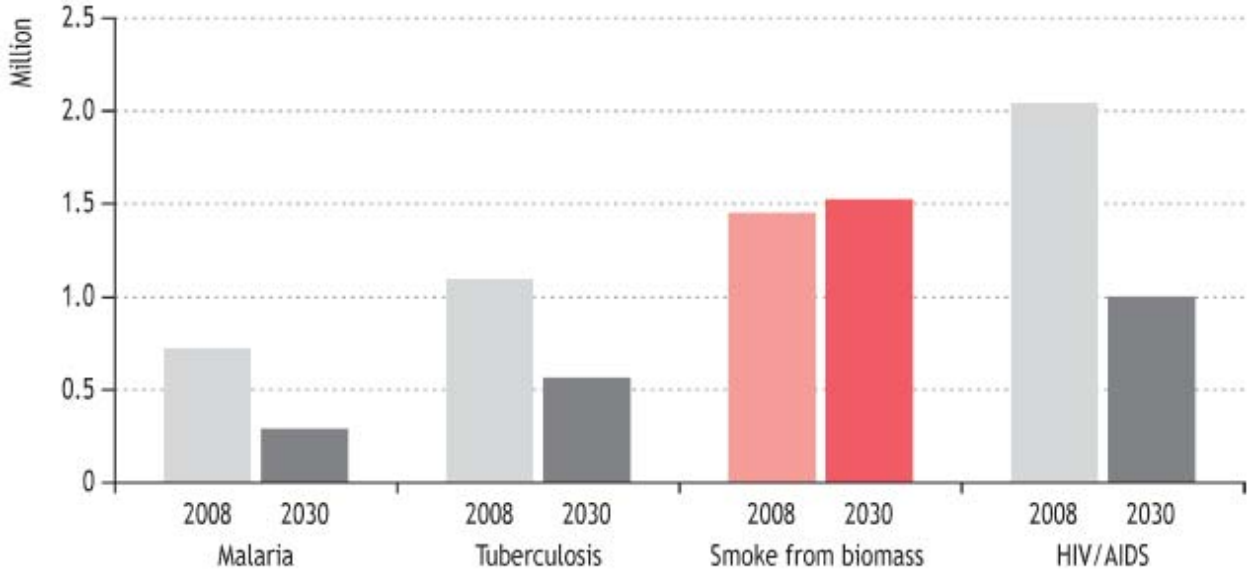
- In sub-Saharan Africa 653 million people rely on the traditional use of solid biomass for cooking – 81% of the population
- Out of these 89% live in rural areas and 46% in urban areas
- Access to reliable modern energy services are required not only for cooking but also for entrepreneurial, agricultural and industrial development



Data Source: UNDP and WHO 2009

Premature deaths from household air pollution and other diseases in 2008 and 2030

- This lack of access to modern energy services entrenches poverty and has a negative impact on health and education and limits economic opportunities
- The MDGs cannot be achieved without access to modern energy services
- Worldwide more than 1.45 million people die prematurely from household air pollution due to inefficient combustion of solid fuels such as wood and charcoal.
- Extrapolating from the global figures about 360 000 people die every year from breathing smoke from biomass fires in sub-Saharan African households



Sources: Mathers and Loncar (2006); WHO (2008); Smith *et al.*, (2004); WHO (2004) and IEA analysis.

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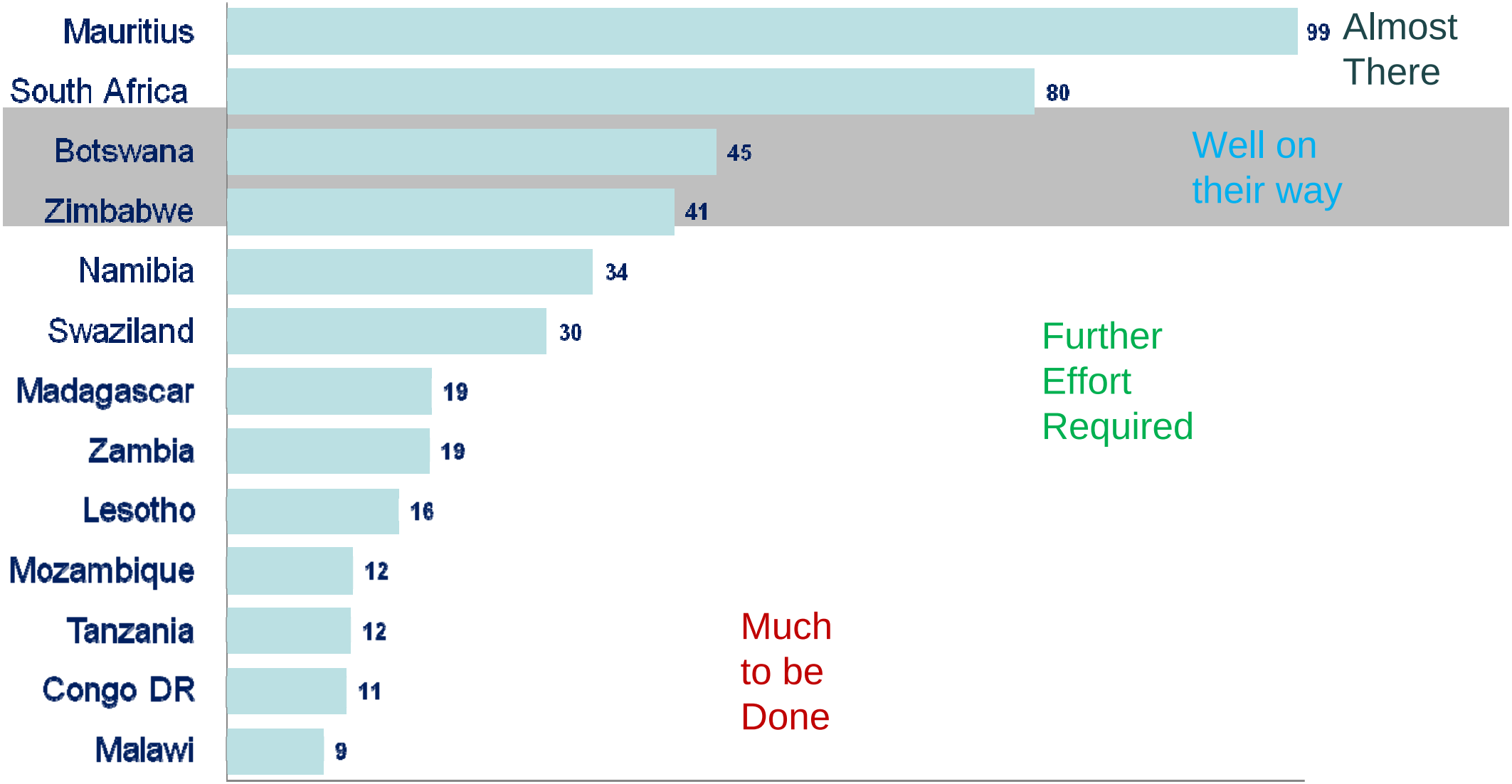
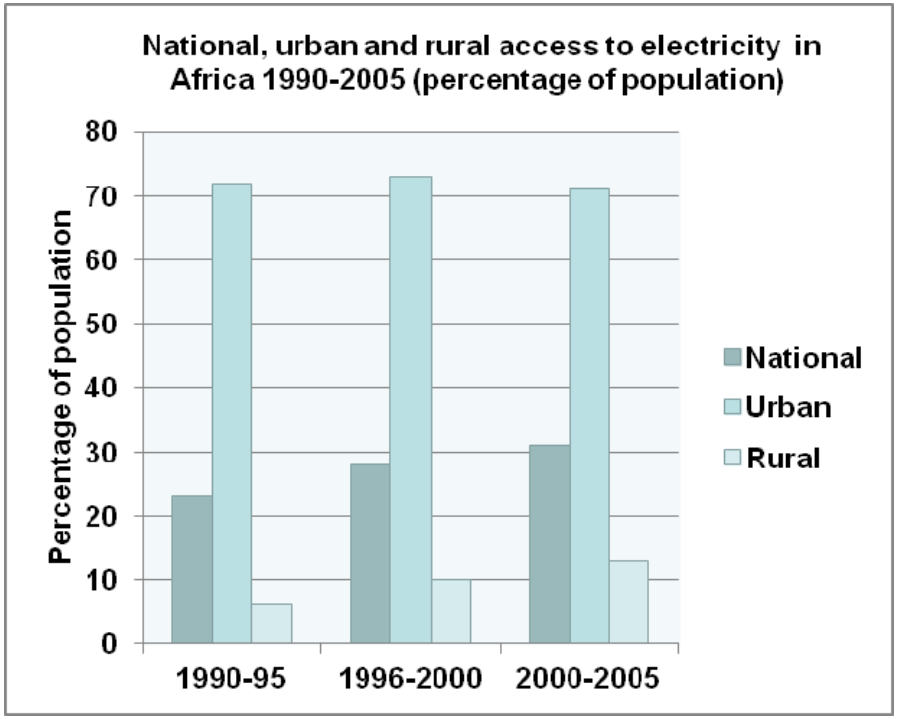
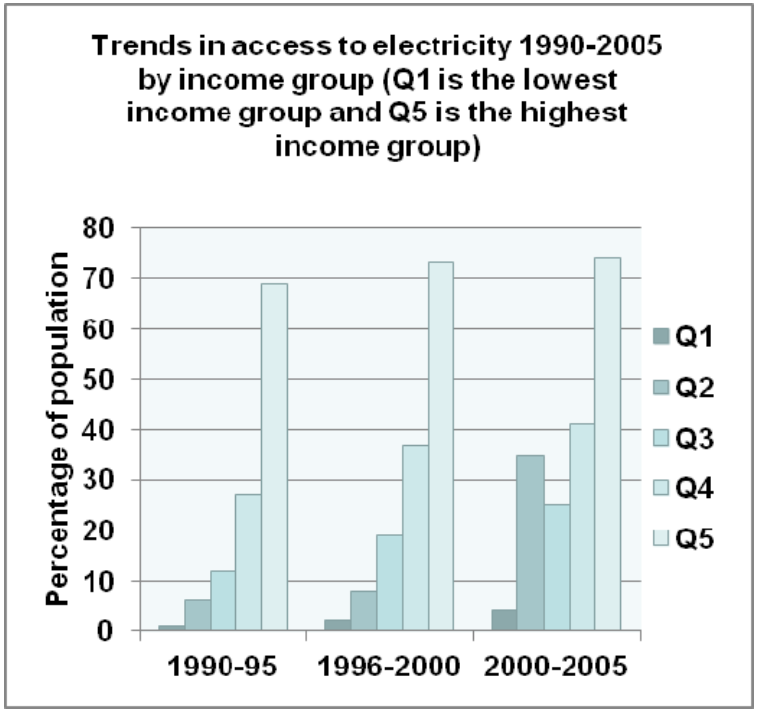
National electricity access levels in Southern Africa (%)

(Data source: UNDP and WHO 2009)

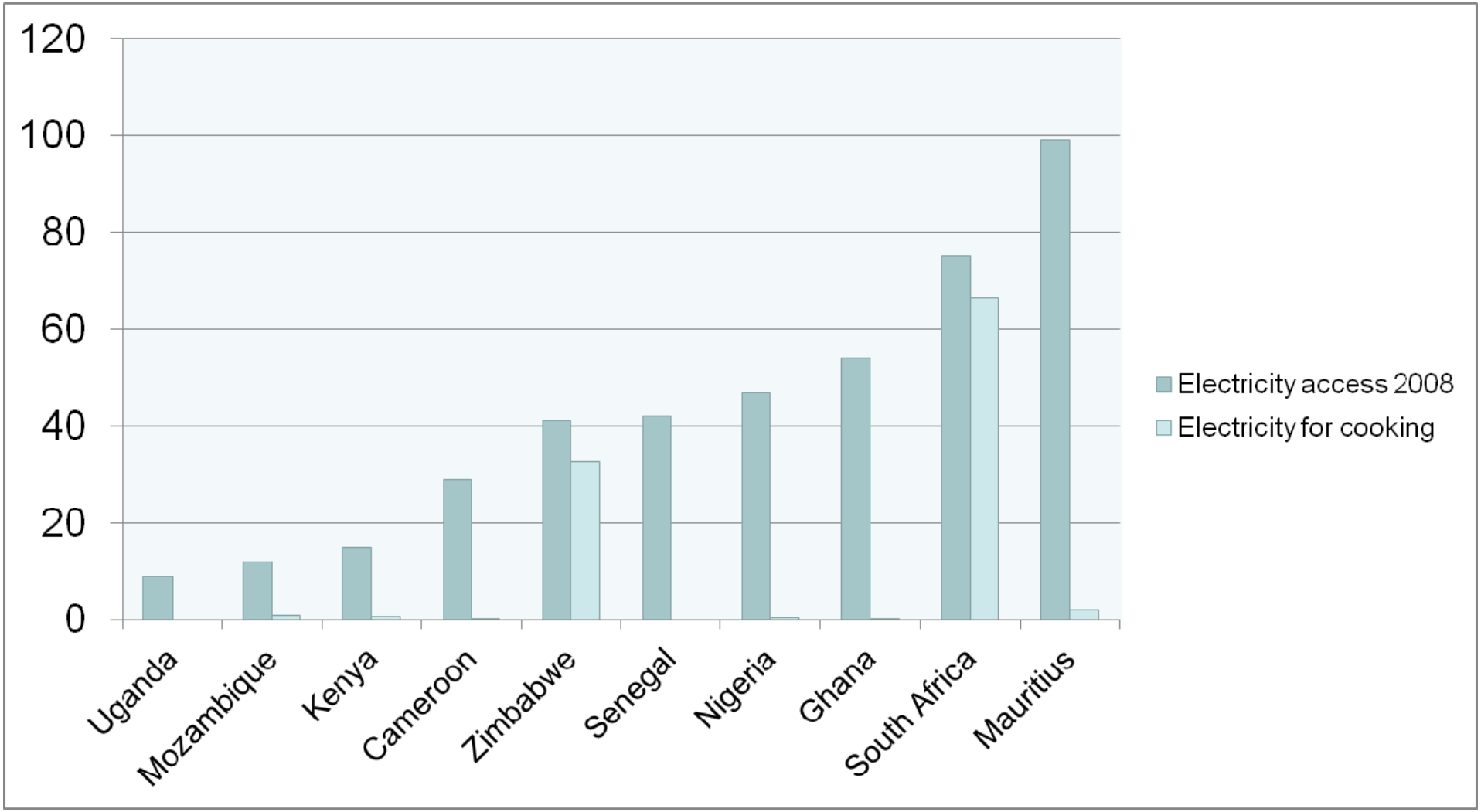


Electricity access by residence in sub-Saharan Africa

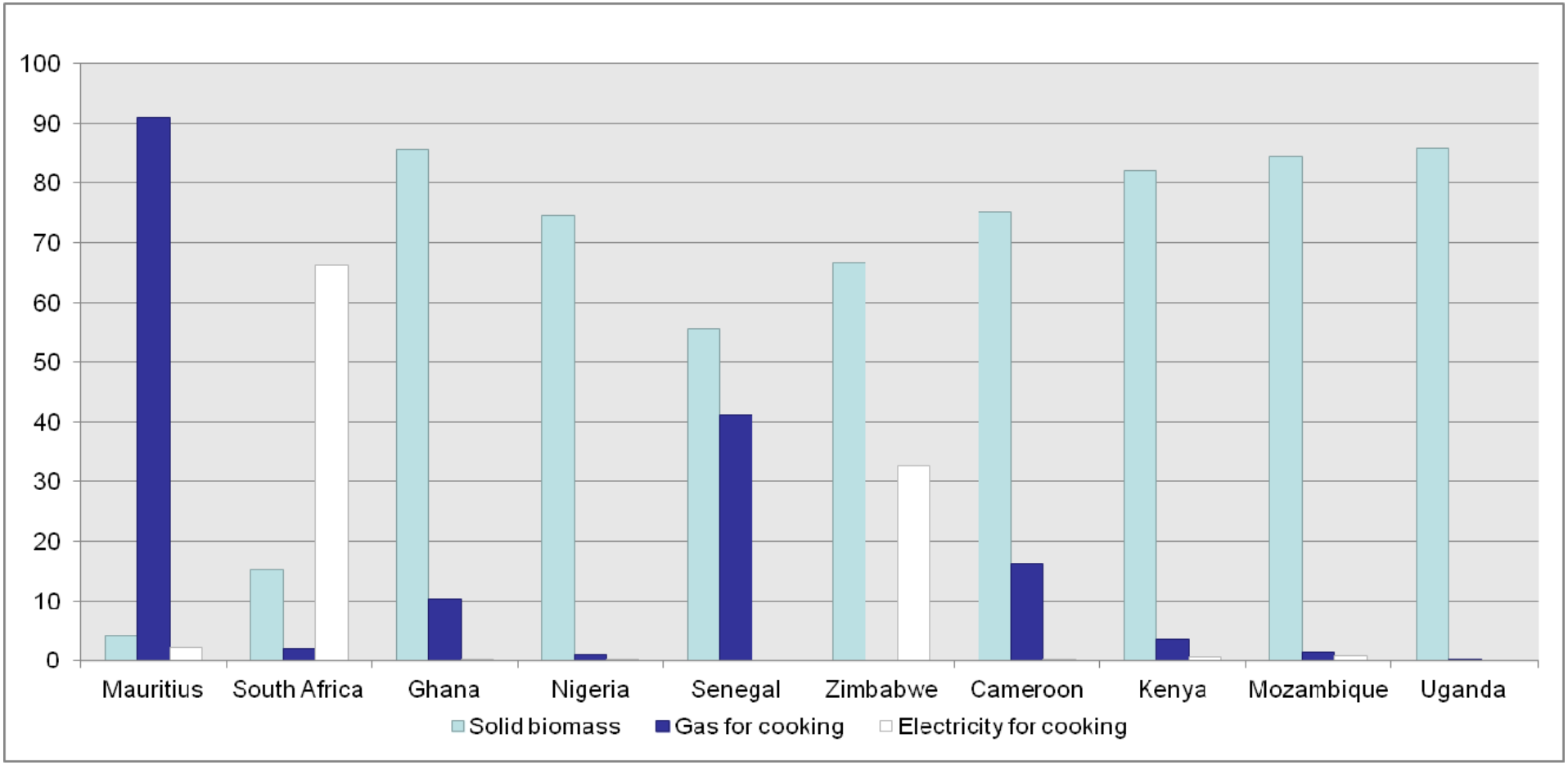




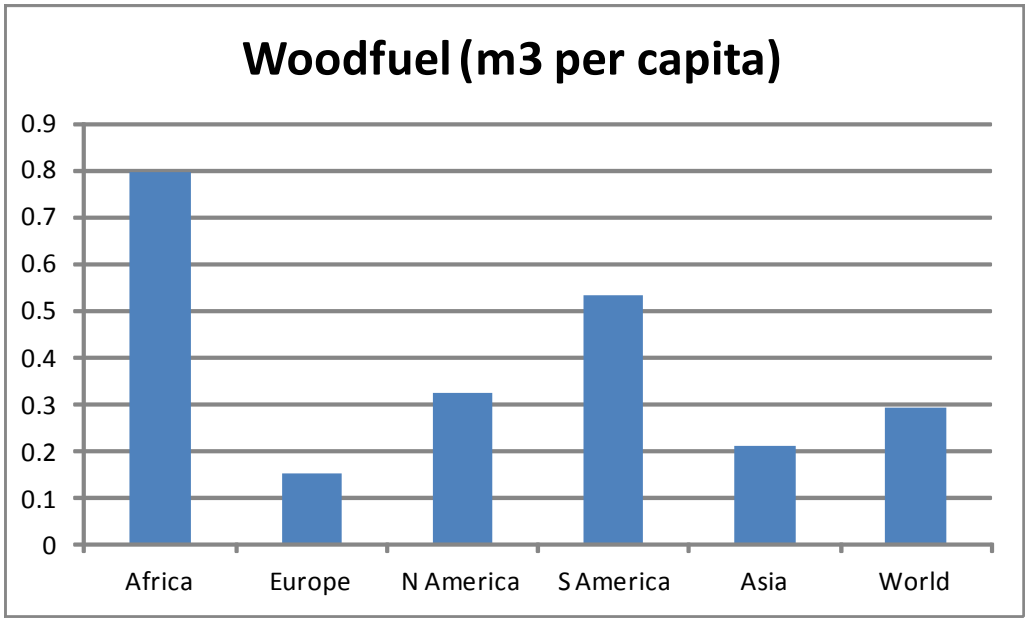
Electricity access and electricity used for cooking in sub-Saharan Africa



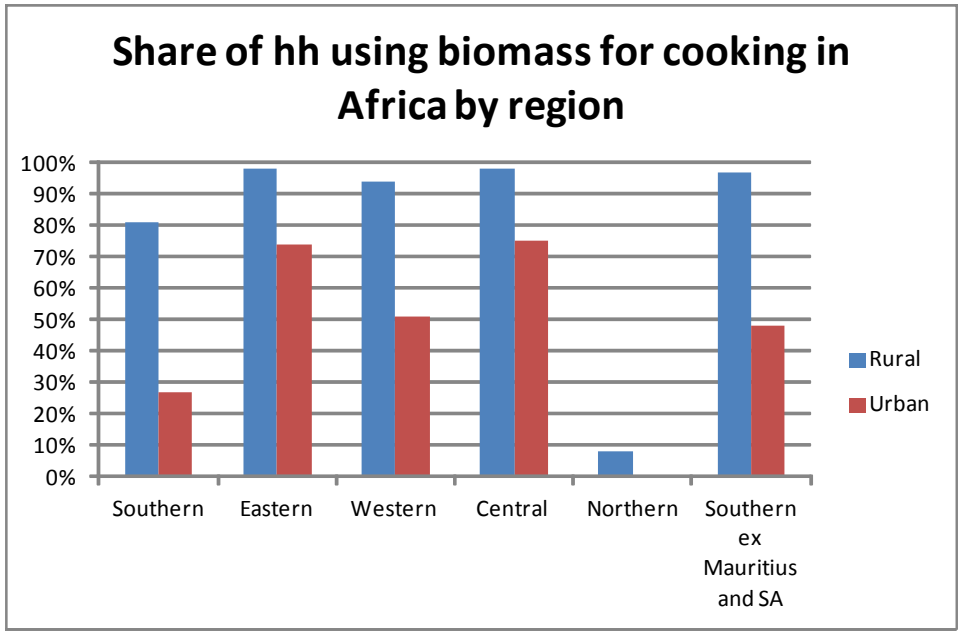
What are people using for cooking? Solid biomass, gas and electricity for cooking in sub-Saharan Africa (% of population)



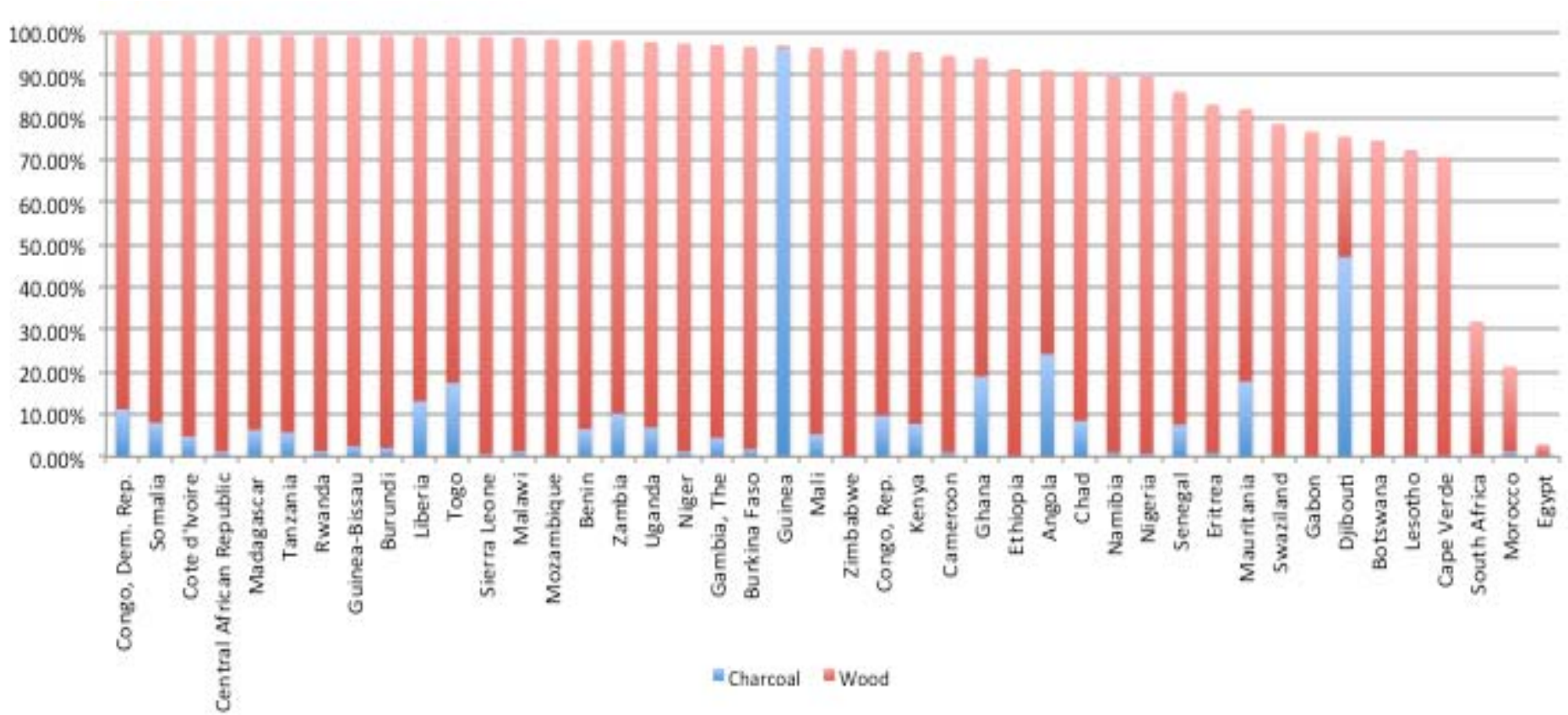
Source: FAO 2003



Source: WHO 2010

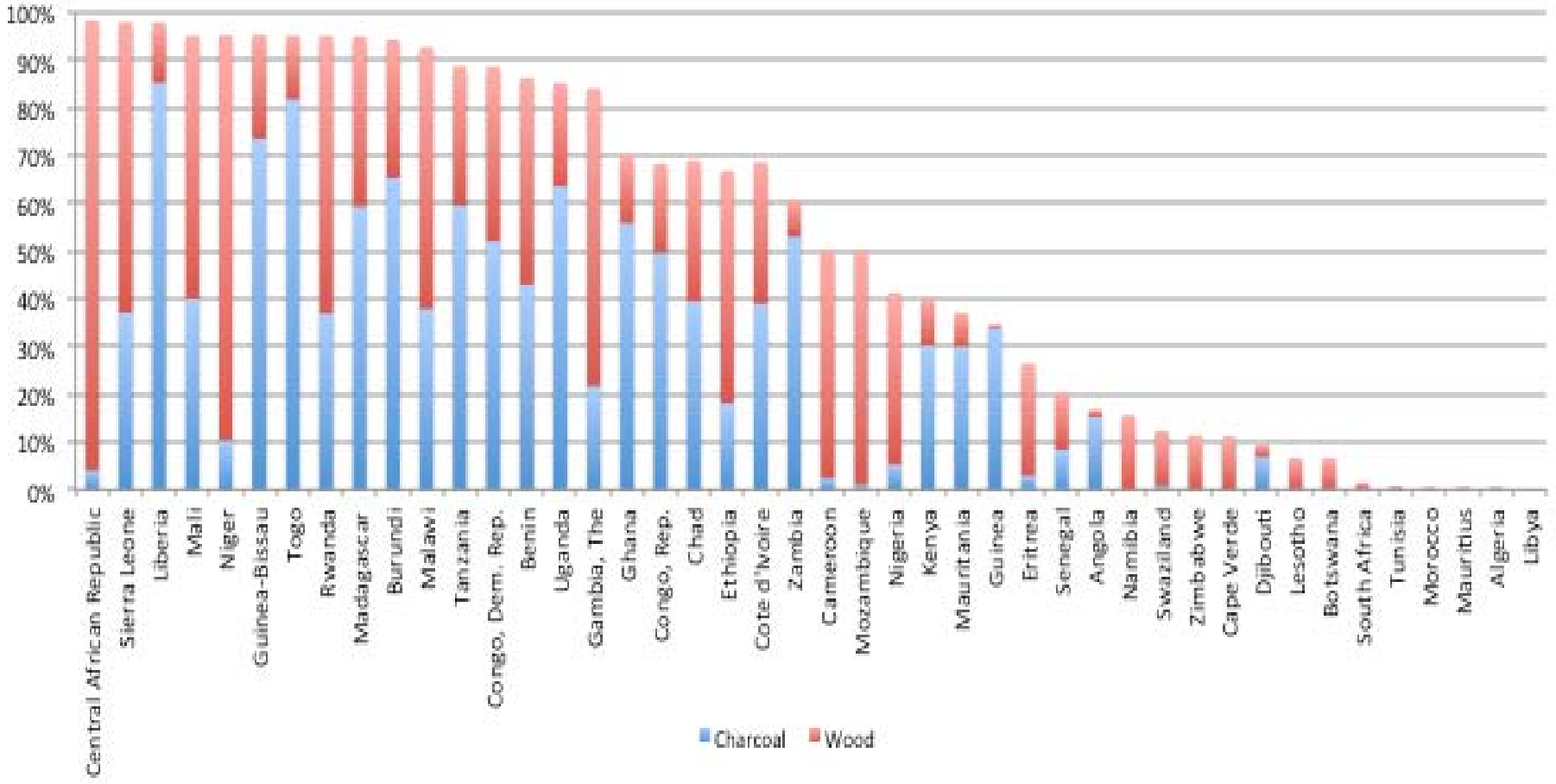


Share of households using wood and charcoal in rural areas in Africa (source: WHO 2010)



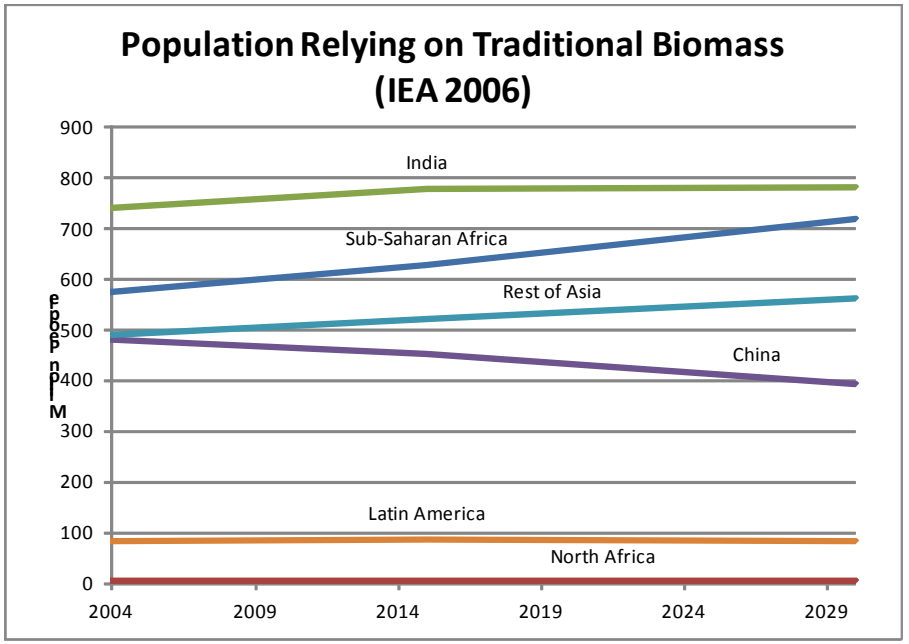
- Apart from Guinea, and Dijibouti, wood is clearly the fuel of choice in the rural context

Share of households using wood and charcoal in the Urban areas in Africa (source WHO 2010)



- Apart from SA, Tunisia, Morocco, Mauritius, Algeria and Libya, biomass still plays a significant role, mainly in the form of charcoal in the urban context

Extrapolation of traditional biomass trends



Benefits of woodfuels?

- For discussion