

ENERGY STATISTICS

THE CASE OF ZAMBIA

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by

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INTRODUCTION

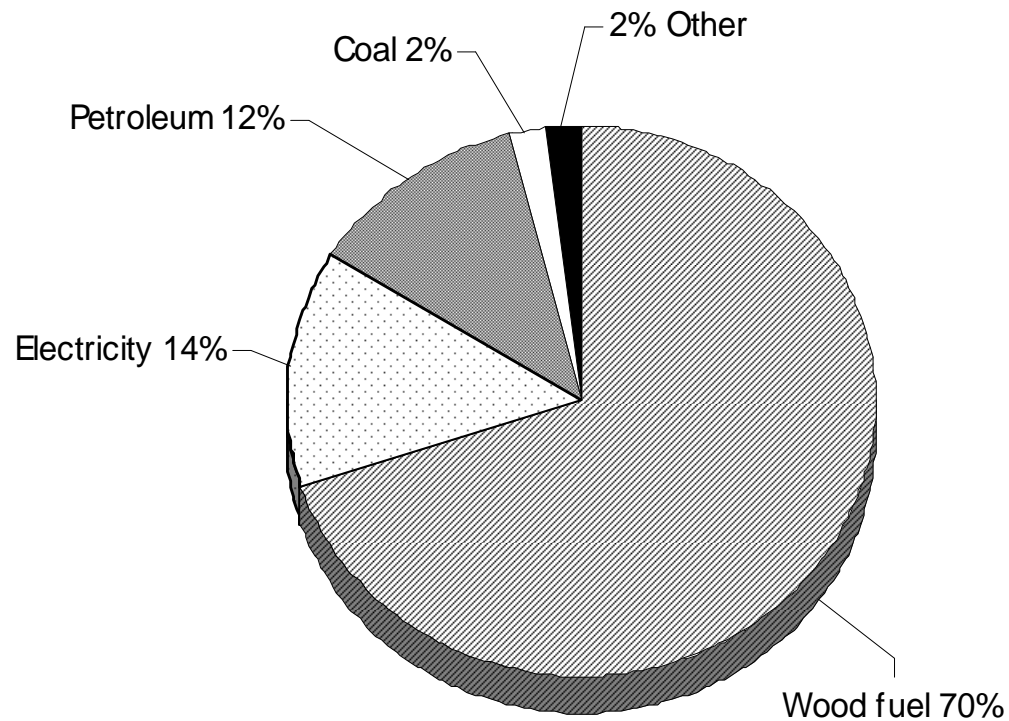
- ❑ Zambia has a population of 10.2 million, of which 62 percent live in rural areas. (CSO Census of population and housing, 2000).
- ❑ Population densities are higher in urban areas as compared to rural areas. Usually, the higher the population density, the higher the environmental concerns in poor countries. This is because the majority of the populations in poor countries depend on the direct exploitation of natural resources for their livelihood.
- ❑ The Human Development Report for Zambia (UNDP, Dec. 1998) has shown that there is a strong correlation between poverty and environmental degradation due to poor people's high dependency on exploitation of natural resources for their survival. Population increase in recent years has resulted in an increasing demand for natural resources such as wood fuel for energy needs because wood fuel is inexpensive and readily available.

Energy Sector Situation in Zambia; an Overview

- Apart from petroleum, which is wholly imported, Zambia is endowed with plenty of indigenous energy resources such as woodlands for wood fuel, hydropower, coal and renewable energy.
- Wood fuel accounts for about 70percent of the total national energy demand while electricity, petroleum and coal account for 14percent, 12percent and 2percent respectively

Energy Sector Situation in Zambia; an Overview

Total National Energy Demand by Source



Energy Sector Situation in Zambia; an Overview

Wood Fuel

- ❑ Traditional wood fuels such as charcoal and firewood dominate energy consumption in Zambia.
- ❑ The main sources of wood fuel are natural woodlands and agricultural lands. According to the *Energy Services Delivery in Zambia Report 2004*, the present consumption of wood fuel exceeds the potential sustainable supply. This is a serious threat to the total forestry land cover, which is currently estimated at 66% of the total land area.

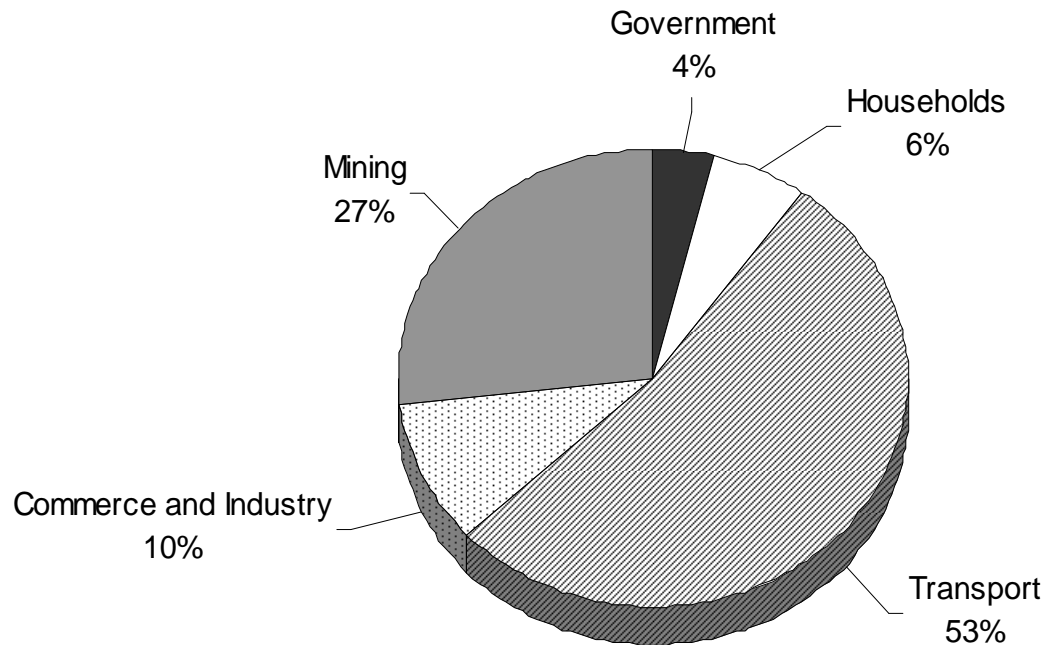
Energy Sector Situation in Zambia; an Overview

Petroleum

- ❑ The country's petroleum requirements are wholly imported and accounts for 12 percent of the national energy demand.
- ❑ The import of petroleum dominates all other expenditure and forms a major part of Zambia's import bill *Energy Services Delivery in Zambia, 2004*.
- ❑ Established infrastructure for petroleum import and processing include the 1,704 km TAZAMA pipeline from Dar-es-Salaam port in Tanzania to INDENI refinery in Ndola.
- ❑ The highest consumer of petroleum products in the country is the transport sector accounting for 53 percent, followed by the mining sector with 27 percent.
- ❑ Refined petroleum products are imported into the country by rail through the Railway Systems of Zambia (RSZ) and Tanzania-Zambia Railway (TAZARA) and by road through authorized oil marketing companies and transporters.

Energy Sector Situation in Zambia; an Overview

Proportion of Petroleum Products consumed by Sector in Zambia



Energy Sector Situation in Zambia; an Overview

Coal

- ❑ Proven coal deposits are estimated at over 30 million tonnes while potential coal resources are estimated to be several thousand tonnes.
- ❑ The main coal company, Maamba Collieries Limited (MCL), currently mines the biggest share of the coal in Zambia.
- ❑ The consumption of coal in Zambia is confined mainly to the mining industry (54 percent), commerce and industry (37 percent) and the government and service sectors (9 percent).
- ❑ The contribution of coal to the total energy balance has been declining over the years due to operational constraints at Maamba Collieries. However production is likely to go up due to fresh investments in the mine after privatization.

Energy Sector Situation in Zambia; an Overview

– Environmental Impacts

- ❑ Although Mamba Collieries Limited has had positive socioeconomic impacts in the area, there have also been negative environmental impacts such as land degradation, surface water and air pollution due to the mining activities.
- ❑ These negative impacts on the environment have remained unaddressed because of not having compelling regulations when mining started.
- ❑ Being a quasi-government body, MCL had a relaxed approach towards addressing, applying and enforcing government environmental laws.
- ❑ Environmental impacts from the coal mining activities at MCL have two sources.
- ❑ There are impacts, which are as a result of coal extraction activities and impacts from the processing and storage of coal.

Energy Sector Situation in Zambia; an Overview

– Environmental Impacts

- ❑ Extraction of coal has been carried out through open cast mining method. This type of mining has had profound effects on the environment which include:
 - Vegetation removal through bush clearing
 - Loose soil removal
 - Competent overburden removal
 - Waste (overburden) dumping. The processing and storage of coal similarly has had some severe impacts on the environment which results in land degradation, air and water pollution.

Energy Sector Situation in Zambia; an Overview

- **Environmental Impacts of Coal Processing**
 - ❑ Coal preparation produces rejected solid material that is discarded into the dump sites which causes further destruction to land and vegetation.
 - ❑ In addition the dumped material is high in mineral content, causing spontaneous combustion in the dump sites, resulting in gaseous fumes which pollute the surrounding communities.
 - ❑ There is also a danger of contaminating ground water as a result of seepage of acid water from the dumps.

Energy Sector Situation in Zambia; an Overview

- **Environmental Impacts of Coal Processing**
 - ❑ Washing of coal produces slurry; and because of improper slurry treatment mechanisms, most of it finds its way into the surrounding water bodies.
 - ❑ Some of the slurry is pumped into the valleys and these have had severe negative impacts on the environment.
 - ❑ The water quality has been severely affected through sedimentation, discharge of acidic effluents into the streams which have lowered the pH hence accelerating the dissolution of the suspended metals like Zinc (Zn), Copper (Cu) Lead (Pb) Cadmium (Cd) and Arsenic (As).

Energy Sector Situation in Zambia; an Overview

– Air Pollution

- ❑ There are two major air pollutants in Maamba, which result from the mining operations namely **particulate coal dust and silica dust**. Both arise from drilling and removal of overburden and coal, blasting and loading operations.
- ❑ Studies revealed that both coal and silica dust concentrations in the air are above the acceptable standards. (*Impact of Mining activities on miners' health, 1991-2002*).
- ❑ Miners are subjected to the above mentioned atmospheric contaminants arising from Coal mining activities. Exposure to these high levels of concentrations has resulted into respiration ailments.

Energy Sector Situation in Zambia; an Overview

– Responses on Land Degradation

It is estimated that a total of 321 hectares of land has been disturbed by Coal mining operations through;

- Removal of material in open cast areas
- Changing the topology / landscape of the area
- Waste dumping and
- Slurry dumps.
- There have been attempts to reclaim part of the land used for dumping mine waste and overburden in mine pits. However, this has not been adhered to because of added costs of transporting waste to the pits as well as laxity due to absence of compelling forces.
- Currently, slurry is dumped in the nearby valleys, an arrangement which has caused severe environmental impacts. The initial design was that slurry would be dumped in a pond with 3 compartments for recycling. This method would have served more than 2 hectares of land that has been taken up by dumping slurry in the valleys. It failed to work out mainly due to poor design and rehabilitation costs.

Energy Sector Situation in Zambia; an Overview

– Responses on Land Degradation

❑ Mining and its associated activities have always been in conflict with the environment. For sustainable development, the mining operations require a good balance between the protection of the environment and economic growth. Mining operation started before the enactment of the Environmental Protection and Pollution Control Act 1990, which was commissioned in 1992. This act comprises a number of regulations, which include:

- Waste management
- Water Management
- Air quality etc

Energy Sector Situation in Zambia; an Overview

– Responses on Land Degradation

- ❑ Despite the existence of the regulation, environmental impacts at Maamba have remained unaddressed mainly due to:
 - Lack of resources to embark on rehabilitation works have contributed to increased environmental degradation. The company has not had sufficient equipment to use for both mining activities as well as rehabilitation activities.
 - Lack of effective enforcement by Environmental Council of Zambia (ECZ), who have not been consistent in visiting the mining areas. As a result, this has led to a relaxed approach where environmental compliance is concerned.
 - Lack of incentives to encourage the mine to embark on programs aimed at environmental protection.

Energy Sector Situation in Zambia; an Overview

- Responses on Land Degradation
- Licenses issued by ECZ
 - ❑ ECZ an environmental regulations enforcing agency licenses MCL for any discharge into the environment to control pollution.
 - ❑ Some of the licenses, renewed annually are:
 - Transportation of waste, including mine township waste
 - Operation of disposal sites
 - Air permits
 - Discharge of effluent into the local stream.

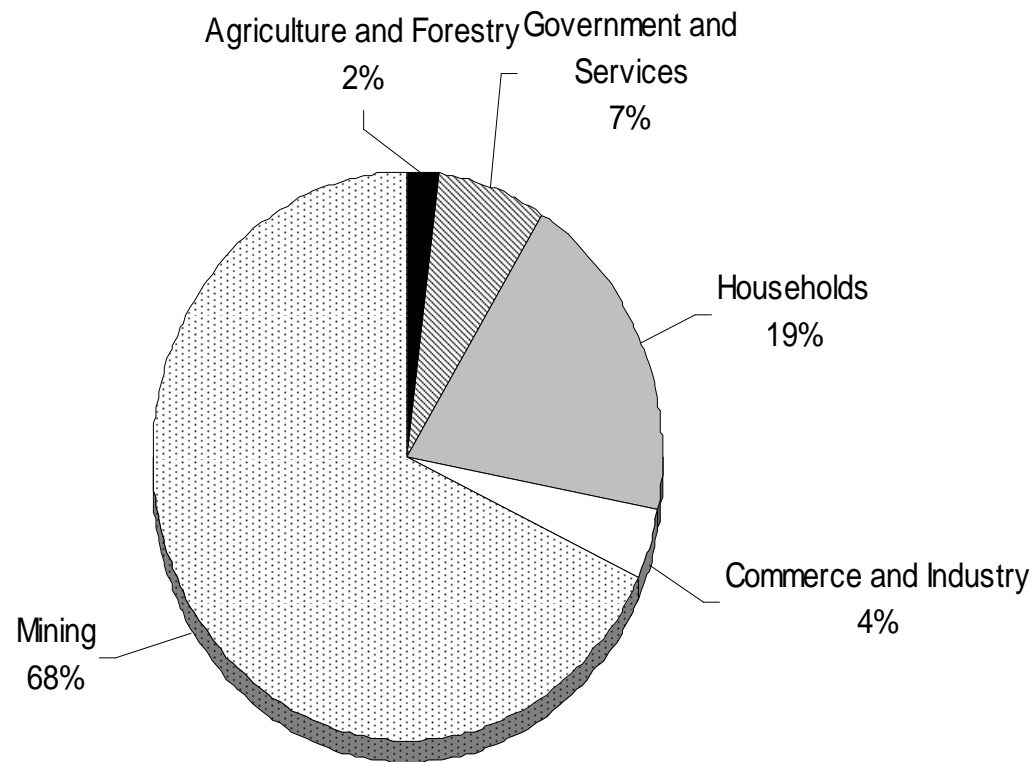
Energy Sector Situation in Zambia; an Overview

» Electricity

- ❑ The hydropower resource potential is estimated at 6,000 Mw. The installed capacity is only 1,760 Mw. This contributes about 14% of total energy use.
- ❑ The hydropower stations supply the national grid while the diesel power generating plants supply isolated loads mainly in remote areas not connected to the grid. The gas turbines, located on the Copperbelt provide standby supply to the mines.
- ❑ The mines are the major consumers of electricity accounting for 68% followed by households, which uses 19%. The Agriculture and Forestry sector is the least user of electricity in Zambia.

Energy Sector Situation in Zambia; an Overview

Proportion of Electricity Consumption by User Group



Energy Sector Situation in Zambia; an Overview

- **Environmental Impacts of Activities**
 - ❑ Generation and transmission of electricity have had severe impacts on the environment.
 - ❑ Even though much of the energy consumption in Zambia is from fuel wood, industries and urban households rely on electricity as a source of energy.
 - ❑ As development of the nation continues to grow, more households and industries will use electrical energy, which will in turn, exert more pressure on the environment.

Energy Sector Situation in Zambia; an Overview

- **Environmental Impacts of Activities**
- **Human**
- **(a) Physical**
- ❑ Impacts on the physical environment include soil erosion due to cutting of trees to facilitate construction of power lines especially if the trees are uprooted instead of stumping.
- ❑ Soil erosion in urban areas can lead to siltation in the rivers and other water bodies.
- ❑ Air quality can also be affected by diesel power stations due to emission of smoke containing carbon dioxide, which has greenhouse effects.
- ❑ Liquid waste discharge, especially used oil from transformers and automobile workshops, can affect water quality and may lead to death of some forms of aquatic life.

Energy Sector Situation in Zambia; an Overview

- **Environmental Impacts of Activities**
 - ❑ Solid wastes such as concrete, steel bars, bolts, nuts, cable drums, paper, plastics, metal and woody vegetation can cause environmental degradation.
 - ❑ Projects also generate domestic waste such as leftover foodstuffs and human waste especially at camping sites for workers.
 - ❑ Noise pollution is created during construction especially where heavy-duty equipment is used in excavating, stringing and tower erection.
 - ❑ During construction of power stations, blasting is employed to construct the powerhouse and tunnels for various purposes.
 - ❑ Noise pollution is, however, limited to the construction period and during routine maintenance.
 - ❑ During the operation of the power facilities, noise pollution is minimal.

Energy Sector Situation in Zambia; an Overview

- **Environmental Impacts of Activities**
- **Biological**
 - ❑ During the construction of power lines and power stations, some animals, reptiles and birds may be killed accidentally.
 - ❑ Poaching of animals, reptiles and birds by construction workers is the major adverse impact especially in places near the national parks.
 - ❑ Damming of rivers for power generation purposes can affect seasonal fish migration and breeding, which can lead to diminishing of certain fish species and other forms of aquatic life.
 - ❑ Cutting of trees for construction of power lines leads to the destruction of trees of commercial value and may also open up protected areas (forest reserves and national parks) to charcoal production and poaching.

Energy Sector Situation in Zambia; an Overview

– Renewable Sources of Energy

- ❑ While wood fuel, petroleum and hydropower will continue to be the major energy sources in Zambia, efforts are being made to develop and expand other energy sources such as solar, mini-hydro and wind.
- ❑ Zambia has a large potential for a variety of renewable energy resources.

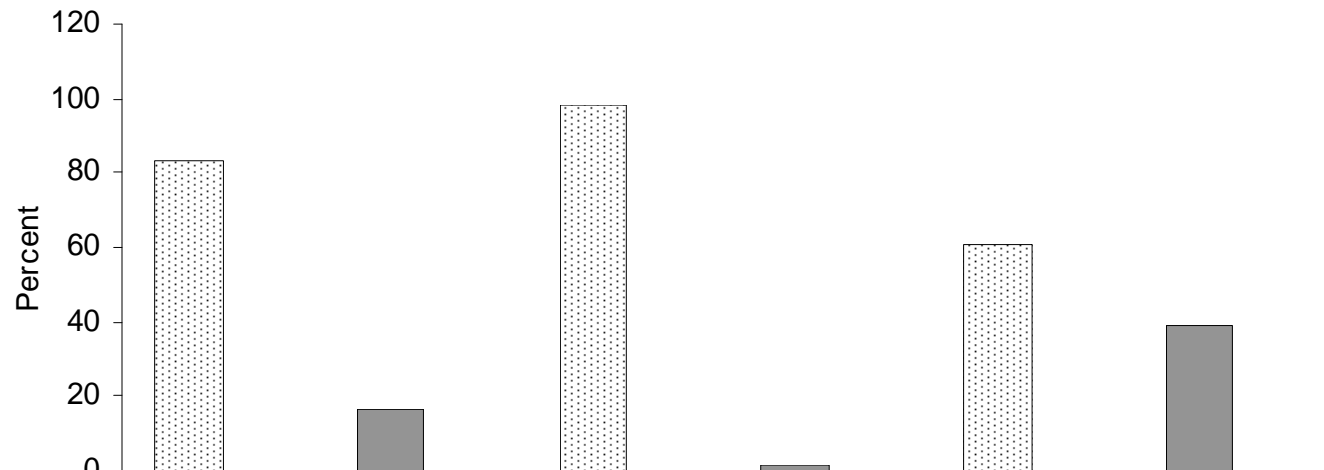
Energy Sector Situation in Zambia; an Overview

– Household Energy Sources

- ❑ According to the results of the Living Conditions Monitoring Survey of 2004, 83.4 percent of the households in Zambia depend on wood resources for their cooking energy.
- ❑ Only 16.2 % have access to electric energy for cooking.
- ❑ About 97.9 % of the rural households solely depend on woody resources for their cooking energy while only 1.7 percent has access to electrical energy.
- ❑ In urban areas, 60.4 percent of the households depend on wood fuel most of which is charcoal.
- ❑ The most urbanized provinces of Lusaka and Copperbelt are the highest in terms of electric energy as a source of cooking energy at 40.2 and 37 percent respectively.
- ❑ The rest of the provinces have less than 10 percent of their households with access to electricity for cooking.

Energy Sector Situation in Zambia; an Overview

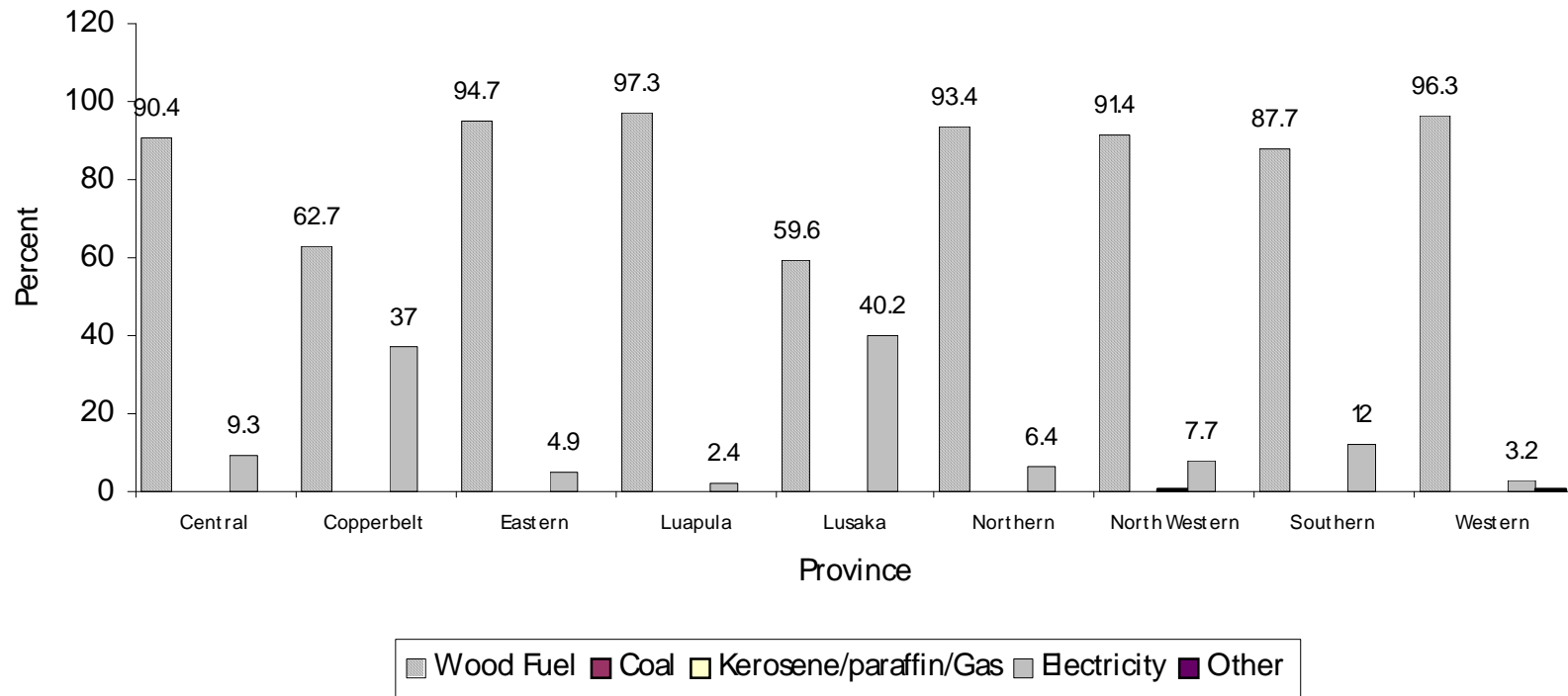
Percentage Distribution of Households by Type of Cooking Energy 2004



| | All Zambia | Rural | Urban |
|-----------------------|------------|-------|-------|
| Wood Fuel | 83.4 | 97.9 | 60.4 |
| Coal | 0 | 0 | 0 |
| Kerosene/paraffin/Gas | 0.2 | 0.2 | 0.2 |
| Electricity | 16.2 | 1.7 | 39.3 |
| Other | 0.1 | 0.2 | 0 |

Energy Sector Situation in Zambia; an Overview

Figure 1.7: Percentage Distribution of Households by Main Type of Cooking Energy by Province, Zambia, 2004



A photograph of a person wearing a light-colored, textured hat and a long, patterned tunic, standing in a field of tall, green and yellowing grass. The person is looking down at the plants. The background shows more trees and a clear sky. The text "THE END" is overlaid in the center in a bold, green, sans-serif font with a white outline.

THE END