

ZAMBIA'S ELECTRIFICATION PROGRAMME : PROGRESS AND ENVIRONMENTAL EFFECTS IN RURAL AND URBAN COMMUNITIES

E S Kalapula

*Geography Department, University of Zambia
P O Box 32379, Lusaka, Zambia*

1. INTRODUCTION

Electricity has always enjoyed the image of being a clean form of energy, particularly when contrasted to energy forms such as charcoal and wood which, when burnt, emit great quantities of smoke, which is considered detrimental to man's respiratory requirements. But, electricity is not cheap as there are costs associated with the installation of appropriate hydro, thermal and diesel facilities. Moreover, consumers, whether industrial, commercial or residential, have to put up with ever-increasing utility rates. Electric appliances and the related paraphernalia easily qualify as luxury articles. In developing countries, therefore, the net effect of these and other factors is to substantially limit the number of users, as cost seems to be of the sole criterion. Those excluded from the use of electricity look for alternative sources of energy. In Africa generally, and Zambia in particular, the preferred alternative form of energy is wood in rural areas, and charcoal in the urban areas. When these are used on a large scale, deforestation (due to ever increasing population and general poverty) and subsequently faster rates of soil erosion ensue. A vicious circle is thus set in train. Viewed this way, the case for less industrialized African countries then summons consideration of the effects of wood products as forms of energy on residential or community environmental pollution.

2. ELECTRICITY GENERATION AND TRANSMISSION IN ZAMBIA

The Zambia Electricity Supply Corporation (ZESCO) was constituted as a Corporation in 1970. What today constitutes the Natural Interconnected Power System, is the combination of ZESCO, the Zambezi River Authority (formerly the Central African Power Corporation, CAPCO) and the Copperbelt Power Company (CPC). The usage is provisional, given that they still run and control their operations independently with no supervisory body.

The Interconnected Power System of Zambia covers only a small part of Zambia (less than 15% of its area). The rest of the country is supplied with power from isolated power stations each having a capacity of several hundreds, or even tens, of kilowatts as well as

from local mini power systems having a total capacity of several thousand kilowatts¹. Zambia's total annual production of electric energy trebled between 1972 and 1983.

The production costs of hydro-electric power in Zambia is one of the lowest in the world². At the same time, the country's hydro-electric power potential (about 4,000 MW) is quite abundant. Presently, installed capacity is at 1,738 MW. This is far in excess of current national use. Unfortunately, however, this form of energy is not made readily available to the public; only a small portion of urban households are connected to an electricity supply. This is because of the high costs involved. There are, however, plans to bring electricity to residents in the urban areas beginning with Lusaka. It is a phased programme, starting in 1987 and ending in 2006.

The ZESCO has divided electricity consumers into three areas; the Copperbelt area, the Southern area and the Rural areas. According to the Corporation's latest annual report (1983/84), the Copperbelt and Southern areas together account for 91% of all electricity consumers and they use 97% of ZESCO's sold units. Of all ZESCO's consumers, 8.9% are in the Rural area using 3.2% of the units sold. Nowhere in all of ZESCO's thirty-four district population do the number of consumers exceed 10% of the population.

3. ENERGY COSTS – FINANCIAL AND SOCIOLOGICAL

The key energy problem facing the majority of the Zambian population can be said to be the rapidly increasing price of charcoal in the towns³. Generally, charcoal is not as cheap as electricity for cooking and heating in the urban areas, but the vast majority of compound dwellers cannot afford the cost of electric connections and appliances.

Urban dwellers can make use of wood, charcoal, kerosene, LPG or electricity. Electricity is a cheaper fuel for cooking, but the disadvantages are the high investment costs of connection charges, internal wiring and possible structural alterations, and the high initial cost of cookers/stoves. Taken on average electricity is therefore more expensive as a fuel source for the majority of Zambians.

The fact that only 6% of households in squatter areas are connected to the urban electric grid, is a reflection of the high cost of connection, even though ZESCO pays one-third of the connection costs.

The generation of hydro-electricity demands large dams and water reservoirs. Although hydro-electrical generation is far less air polluting than thermal stations, there is significant sociological costs to hydro systems. The recent literature on Zambian environmental conservation and development has, indeed, acknowledged and confirmed the fact that dams and other impoundments, if not properly planned, can be a cost to society⁴. To illustrate and elaborate on these claims, albeit briefly, two examples will suffice. These are the case of the middle Zambezi, site of the giant Kariba Dam, and the Kafue Hydro-electric scheme of recent years, on the Kafue River.

The Middle Zambezi

Prior to the completion of the Kariba Dam in 1958, approximately 86,000 Gwembe Tonga of Zambia and Zimbabwe considered themselves people of the Zambezi⁵. The basis of their economic system was the annual double cropping of the more fertile Zambezi alluvia. The Zambezi and its alluvia, despite frequent annual stress periods and occasional famines, nevertheless supported the densest rural population in central Africa.

As a result of the Kariba Dam, 6,000 people moved to the Lusitu area below the dam. Relocation increased population densities by a factor of four. The result has been a process of desertification which has turned the Lusitu area into a dust bowl within twenty years. Termination of the annual flood seriously reduced both the dry-season harvests of the downstream farmers and the yields of the fishermen.

Relocation to new environments broke family and village units. In extreme cases, it also resulted in death due to stress, famine and starvation. There were no sound contingency plans made for the people. Many were resettled on poor soils.

This goes to show that even the most beneficial projects are associated with costs; the economic cost is always considered and planned for, but social and environmental costs are usually considered secondary, if they are considered at all. The cost could be minimized by assessing what the impacts could be early on in the project planning stage, and taking corrective measures to alter project design, minimize impact, or include environmental management in the project to mitigate unavoidable impacts. Luckily, this situation is now being appreciated.

Kafue hydro-electric scheme

The Kafue Gorge Dam and Power installations became operational in 1972, while the Itezihitezhi Regulatory Dam was completed in 1978. Before these developments, and with some hindsight of the Kariba experience, a couple of baseline studies were carried out in the Kafue River Basin by the FAO on a variety of themes related to the environmental base. The University of Zambia Kafue Basin Research Committee continued to study various problems associated with hydro-electric power development long after the completion of the earlier phases of the scheme.

Even here, indications of various environmental costs, which were not considered at first, are now acknowledged. The scheme had had negative environmental impacts on wildlife in the Kafue Flats, traditional cattle husbandry and ranching, and the Nakambala Sugar Estate, which were not adequately predicted at the planning stage⁶.

4. ENVIRONMENTAL POLLUTION

Pollution is defined as an action which produces any substance which has detrimental effects on the natural environment. The material released may be gaseous, water soluble or water insoluble. A good example in Zambia are the smelters on the Copperbelt, which release sulphur dioxide, carbon dioxide and minute dust particles into the atmosphere.

Electricity, as such, is non-polluting, although actions leading to its generation could cause, abet and accelerate pollution. The main point of the argument for Zambia, at least, is that the high cost of using electricity has forced the majority of households to turn to cheaper forms of energy. It has been estimated that 95.5% of households in Zambia utilize either firewood or charcoal from woodlands. Wood is burnt mainly by rural, and low-income urban households.

Overall, some 1400-1500 km² of Zambia's woodland may be removed each year to meet domestic demands for woodfuel. As at least fifty years is required for woodland regeneration, it appears that as much as 75,000 km², equivalent to 10% of Zambia's total area, is required to meet the demands if supplies are to be sustained from naturally regenerated woodland⁷.

In Zambia, a great deal of deforestation is occurring in the Central, Lusaka and Copperbelt Provinces. Given the high cost of alternative energy sources, especially imported petroleum and indigenously supplied hydro-electric power and coal, the demand for cheaper woodfuel will grow even further.

A clear-cut connection between this massive use of woodfuel and household pollution has not been fully established. It may be because much of such woodfuel consumption is for food preparation and not the central heating of houses and cooking is almost always an outdoor activity.

Clear-felling of woodlands for woodfuel and agriculture is causing concern among environmentalists. The fear is that such activities are inducing and accelerating soil erosion, which, if unchecked, can dramatically reduce crop reduction levels. This trend, in turn, could lead to increased malnutrition, even starvation. Imported food, if not subsidized, is costly.

Pollution related to industrial activities is rarely reported. Kabwe lead and zinc mine, Chilanga Cement Factory and Kafue Nitrogen Chemicals do emit gaseous substances which descend on the windward located compounds. The Copperbelt mine smelters admit that they emit gaseous substances that are a local nuisance, but deny that they produce any ecological ill effects. This caginess is unhelpful considering the seriousness of the problem.

5. CONCLUSION

The relationship between of hydro-electricity and woodfuel consumption is based on cost considerations. A bag of charcoal is a lot cheaper for the majority of households than units of electricity and related appliances. But charcoal emits smoke which, when inhaled in large proportions and for extended periods of time, can be harmful to the health of affected individuals. Clear-felling also induces soil erosion. Wind-borne sand particles, especially in the months of July and August, are therefore increased. Reference has also been made to industrial pollution and especially the smelters in the Copperbelt and other industrial installations in the country. Although the problem is prevalent, hard facts related to industrial pollution remain only inferential, owing to the particular industrial economic interests.

Environmentalists have drawn the attention of planners to certain ill effects of hydro-electricity power development. Concern has also been expressed with

regard to woodland clearance for charcoal burning. It hus seems appropriate to move a step further: to draw the direct and indirect connection between energy requirement, development and pollution of the environment, and the effects of pollution especially on people and their agricultural products. The areas and numbers of those affected may be small. Nonetheless human loss due to careless technological development is always undesirable and steps should be taken to minimize and mitigate probable causes, especially during the planning stage. Continuous monitoring of possible pollutants is also necessary in order to initiate and execute timely corrective measures. Such actions should, if necessary, be backed by effective and well-framed laws. The time to do this is now.

6. REFERENCES

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