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Affordability and Expenditure Patterns for Electricity and Kerosene in Urban Households in Tanzania

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This policy brief is dedicated to the work of Dr. Raymond Mnenwa, who passed away before the publication of this piece.

Key messages

- Modern sources of energy, i.e. electricity and LPG, are not affordable to poor urban households.
- Charcoal is the most important source of energy in urban areas, not only for the poor but also for the non-poor. This raises serious concerns about environmental conservation.
- Households do not depend on one source of energy, such as electricity or kerosene alone, for example. Instead they use a "mix" strategy. Households spend a minimum on electricity while spending more on cheaper sources of energy.
- These findings point to one policy implication in relation to the cost of modern sources of energy: the need to reduce recurrent cost of electricity through improving the efficiency of TANESCO, coupled with tax exemptions on fixed components associated with access to electricity.
- Charcoal can be produced by using high-efficiency technologies, thus reducing environmental degradation.

Introduction

Can the urban poor of Tanzania afford the cost of using modern sources of energy,[1] i.e. electricity, liquefied petroleum gas (LPG) and kerosene?

This question has been repeatedly raised, primarily in the political arena, and unfortunately less so in academia. Three major factors reveal the importance of energy affordability in Tanzania. First and foremost is the persistent crisis in the affordability of kerosene and electricity. Second, the continued widespread dependence of households on lower cost biomass sources of energy, especially wood and charcoal, has led to ongoing environmental concerns.

1 Meikle & Bannister (2002). Significance of energy for poor urban livelihoods: Its contribution to poverty reduction. DPU News, 44, 2; World Energy Council (1999). The challenge of rural energy poverty in developing countries. London: World Energy Council/Food and Agriculture Organization of the United Nations.

Third, in recent years, there has been growing public dissatisfaction with the management of Tanzania's energy sector, coupled with dissatisfaction over the practice where the Tanzania Electric Supply Company (TANESCO), which is the principal supplier of power in the country, uses price hikes as the primary approach to bridging the gap between the company's operating costs and revenues. This has further limited the possibility for poor households to access electricity. As the African Economic Outlook 2003/04 report observed, the absence of modern sources of energy at reasonable prices is a serious poverty trap in Africa (African Development Bank [AfDB] & Organisation for Economic Co-operation and Development [OECD], 2003).[2]

These factors have fuelled an intense debate in recent years on the extent to which households in developing countries like Tanzania can afford modern sources of energy. Furthermore, energy expenditure patterns also lead to the question of whether higher rates of economic growth, which Tanzania has experienced since 2000, supports a shift from traditional biomass sources of energy to technologically efficient sources of energy. According to energy transition theory, as an economy grows, households will increasingly substitute biomass sources of energy with LPG, kerosene and electricity.

Using data from the Household Budget Survey 2007 (URT, 2007),[3] and closely following Kebede et al. (2002),[4] this study investigates the empirical side of energy transition by answering three main questions:

(i) Can poor households in urban areas afford modern sources of energy, i.e. kerosene, LPG and electricity?

(ii) What are the main energy expenditure patterns within urban households?

(iii) Do we see evidence of a shift away from traditional and rather inconvenient sources of energy towards technologically efficient forms like LPG, electricity and kerosene?

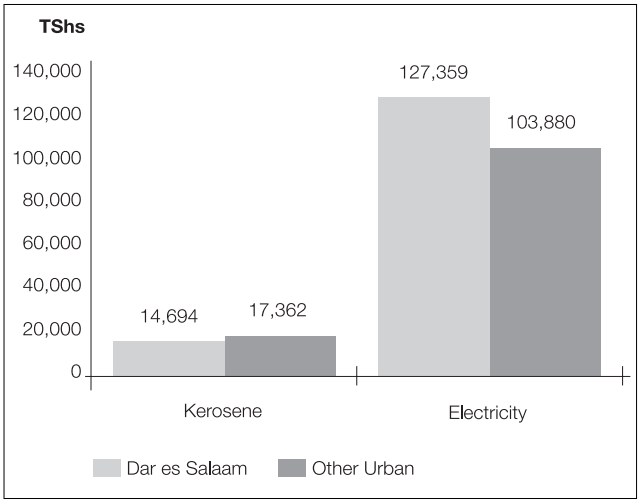
2 AfDB & OECD (2003). African Economic Outlook 2003/2004.
3 United Republic of Tanzania (2007). Household Budget Survey 2007. Dar es Salaam. National Bureau of Statistics (NBS).
4 Kebede, B., et al. (2002). Can the urban poor afford modern energy? The case of Ethiopia. Energy Policy, 30, 1029-1045.

Main Findings

Cost of LPG, Electricity and Kerosene[5]

The main finding from the analysis shows that all Tanzanian households using LPG are non-poor – i.e. no households below the poverty line use gas. By employing the annualised costing approach, LPG is the most expensive energy source compared to electricity and kerosene. Even in the cheapest electricity cost category, kerosene is only 13 per cent of the cost of electricity. Looking more closely at the data reveals cost variations at the regional level, where the costs of kerosene in other urban areas are 18 per cent higher than in Dar es Salaam, while electricity costs are 23 per cent higher in Dar es Salaam than in other urban areas (see figure 1).

Figure 1: Differences in Energy Costs between Dar es Salaam and other Urban Areas



Affordability of Electricity and Kerosene to Poor Urban Households

Results on affordability show that kerosene is an affordable source of energy to poor households, while the opposite is true for electricity. The analysis, which is illustrated in the figures above, basically compared household purchasing power with the costs of accessing sources of energy (kerosene, electricity).

5 The costs of electricity and kerosene include both recurrent costs (e.g. litres of kerosene per kilowatt hour (kWh) of electricity consumed) and fixed costs (the expenditures required to purchase the fixed components necessary for using kerosene and/or electricity, for example, an electric stove, light bulbs, internal wiring and electricity (LUKU8) meter). To estimate the cost of fixed components, an annualised method of depreciation is applied.

Figure 2 compares the energy purchasing power of poor urban households (for each of the three household purchasing power categories: low, medium and high) with the three cost categories of using kerosene (cheapest cost category, medium cost category and expensive cost category).

The energy purchasing power of poor households in all three categories is significantly higher than all three cost categories of using kerosene. In particular, the cost of using kerosene is only 23 per cent of the energy purchasing power of poor households. This confirms that based on the 2007 data, kerosene was affordable to poor urban households in Tanzania. However, it should be understood that a number of policy changes have taken place since 2007, leading to a significant rise in kerosene prices.

Figure 2: Energy Purchasing Power of Poor Households Compared to the Costs of Kerosene

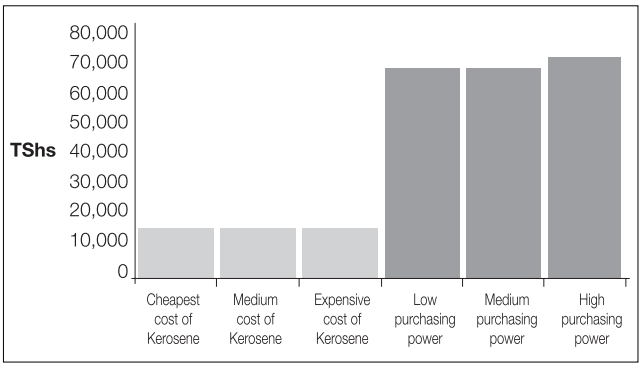
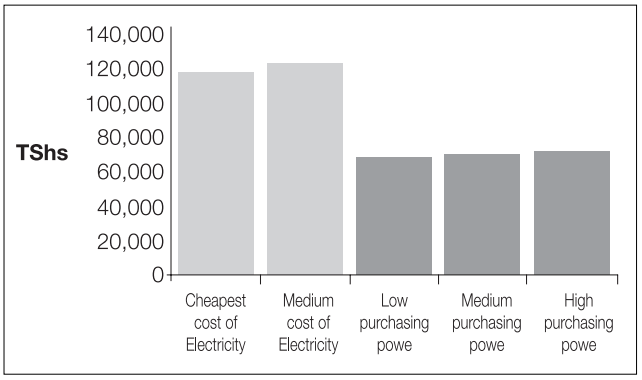


Figure 3 compares the two cost categories for electricity with the three categories of household energy purchasing power. Results show that all cost categories of electricity are significantly higher than the energy purchasing power of poor households.

The highest level of energy purchasing power is only 61 per cent of the cheapest cost of using electricity and 58 per cent of the medium cost category. This indicates that electricity is far too expensive for poor urban households.

Figure 3: Energy Purchasing Power of Poor Households Compared to the Costs of Electricity



Patterns of Household Energy Expenditures

There is wide volatility in energy expenditures, resulting from a tendency of households to use different energy sources for different purposes. For instance, electricity is used for lighting while charcoal alternates with kerosene for cooking. Households spend an average of 11.5 per cent of their total expenditures on energy, with no major differences between poor and non-poor households. Hence, these findings do not support the common hypothesis that poor households use a higher proportion of their income on energy compared to non-poor households.

Table 1: Sources of Energy for Cooking and Lighting

Source	Cooking	Lighting
Electricity	0.5	12.3
Gas - Industrial	0.2	-
Gas - Biogas	-	0.1
Kerosene	3.0	83.0
Charcoal	22.8	-
Firewood	73.3	3.6
Candles	-	1.0
Other sources	0.2	-
Total	**100**	**100**

In terms of the individual sources of energy, data from HBS 2007 confirm that charcoal is the most important source of energy in urban areas, not only for the poor but also for the non-poor. Indeed, charcoal absorbs some 57 per cent of the average household energy budget.

The share of charcoal within total energy expenditures is higher for non-poor households (59 per cent) than poor households (41 per cent). This finding is contrary to the theoretical assumption that traditional sources of energy, which includes charcoal, are more commonly used by the poor (rather than the non-poor) and that price differences have little effect on energy selection. In contrast to charcoal, electricity is found to have the lowest energy budget share. Households spend the minimum on electricity while spending more on cheaper sources of energy (mixing electricity with other sources).

Conclusion and Policy Implications

Two major findings emerge from this study. First, electricity and LPG are not affordable to poor urban households. Second, charcoal is the single most important source of energy in urban areas, not only for the poor but also for non-poor households. While some evidence was found that a higher proportion of non-poor households use electricity compared to poor households, non-poor homes still use charcoal as their primary source of energy for cooking. This is an indication that the increase in income over the past decade is too slow to permit households to switch from traditional biomass energy to more technologically efficient sources of energy, such as electricity and LPG.

These findings point to two policy implications in relation to the cost of modern sources of energy. The government could support cost reduction by (i) reducing recurrent electricity costs through improving the efficiency of TANESCO and (ii) issuing tax exemptions on fixed components associated with access to electricity. For example, on top of the standard VAT of 18 per cent, an import duty is charged on electric cookers. This duty could be eliminated as a way to encourage the use of electricity for cooking. Furthermore, the HBS 2007 data reveals a reduction in the use of electricity for lighting in urban areas and an increase in the use of kerosene instead. By lowering tariffs, TANESCO could increase its revenue and market, as urban residents will be encouraged to switch to electricity..

Yet one major challenge remains: Only 12.1 per cent of households in Tanzania are connected to the national grid (HBS, 2007). While it is not within the scope of this study to look at supply factors and operational inefficiencies, there is an obvious need for massive investments in the electricity network in residential areas as one of the means to ensure a faster transition from biomass to modern sources of energy. There is also a scope for interventions to reduce the negative environmental consequences of producing and using charcoal. Currently, the production of charcoal is entirely based on traditional, low-efficiency technologies. Hence, from an environmental standpoint, there is a clear need to improve charcoal production techniques and promote the use of efficient charcoal stoves.

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