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Load Shedding and Charcoal Use in Zambia: What Are the Implications on Forest Resources?

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KEY POINTS

1) Fuel wood make up a large share of the energy budgets among households in several Sub-Saharan African countries, and in Zambia, it constitutes between 76% and 90%.
2) Load shedding is undoubtedly one of the primary drivers of increased production, trade, and demand for charcoal among Zambian households between 2013 and 2015. The number of charcoal kilns produced per person has increased, with incomes of charcoal producers increasing by over 53.2% between 2013 and 2015. The income of charcoal traders has doubled to ZMW 978 per month, while charcoal prices have increased by ZMW 15 per 25 Kg bag.
3) Producers reported that preferred species [i.e., trees of the genera *Brachystegia Spp (Musamba, Kaputu, Muombo and Musompa), Julbernadia (Mutondo)* and *Isoberlinia (Mutobo)*] have continued to disappear resulting in harvesting and the use of alternative and unsuitable or even undesirable tree species such as some fruit trees [e.g., *Uapaca kirkiana (Masuku)* Mull. Arg. and *Piliostigma thonningii (Musekese)*].
4) Prolonged load shedding in Zambia is likely to lead to more clearing of forests and woodlands. Unlike clearing land for agriculture, this is expected to lead to loss of forest resources, and associated ecosystem services.
5) *Ultimate*ly, the high demand for charcoal arising from load shedding guarantees economic sustainability of charcoal production. However, ecological sustainability may not be attainable given that the standing stock in the natural forests and woodlands is declining. Further, if unabated this would worsen climate change impacts.

INTRODUCTION: Fuelwood has by far been shown to make up a commanding share of the energy budgets among households in several countries (Syampungani 2008; Chidumayo 1997; Hibajene and Kalumiana 2003; SADC 1993; Falcáo 2008). Thus, where electricity fails to meet the household energy demands, consumption of fuelwood is expected to increase, and in turn, increase the pressure on forest resources. Since 2012, Zambia has experienced increased load shedding partly due to inadequate investments in generation capacity, but more due to poor rainfall and a resulting decrease in generation given its heavy dependence on hydro-electric power (Samboko et al. 2016). Certainly, the current inadequacy and erratic supply of hydroelectric power in Zambia make charcoal the main energy source among several households. As such, households are likely to have increased the share of expenditure on wood fuel in their energy budgets.

Zambia has an alarming deforestation rate—estimated between 250,000 and 300,000 ha per annum—which further highlights the importance of understanding the impact of load shedding on forest degradation and deforestation (Mulenga, Tembo, and Sitko 2015). Loss of forests has negative implications on the three major dimensions of forest benefits/use, i.e., direct use benefits, indirect use benefits, and intermediate use services, reduction (cultivated), and other services (Dlamini and Geldenhuys 2012; Dlamini 2013). These forest benefits sustain livelihoods of local inhabitants and other forest dependent communities, as well as contribute to other

ecosystem goods and services. For example, forests are an important source of food and income that contribute to livelihoods and dietary diversity for rural households (Mofya-Mukuka and Simoloka 2015). Based on the prevailing load shedding and increased demand for charcoal, which have high potential to affect both the biophysical resources and human resources, field research was commissioned through rapid surveys with the following specific objectives:

1. to establish the potential trends in charcoal demand and supply as well as range of prices between 2013 and 2015 (before and after load shedding crisis soared);
2. to estimate the cutover area and calculate the number of charcoal bags produced;
3. to determine the state of natural regeneration and species distribution and composition in charcoal abandoned areas.
4. to identify key issues and refine policy recommendations to address the potential negative impacts of load shedding on charcoal production and trade and forest ecosystems in order to reconcile economic sustainability with ecological sustainability.

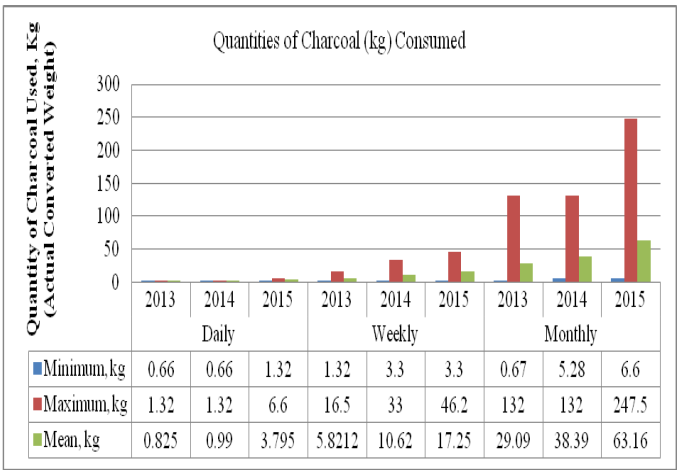
DATA AND METHODS: Data were comprehensively captured using two rapid surveys and results from discussion papers by Dlamini et al. 2016a and Dlamini et al. 2016b: (i) the socio-economics of charcoal production and trade and its implications for forest ecosystems in the prevailing load shedding in Zambia (Dlamini et al. 2016a); and (ii) ecological impacts of charcoal production on plant species diversity and forest landscape in the selected Zambian Miombo woodlands (Dlamini et al. 2016a). The report mainly seeks to highlight the potential implications of load shedding rather than the actual impacts, which would be addressed in a separate study.

KEY FINDINGS:

Load Shedding, Charcoal Production, and Demand: Load shedding has resulted in increased demand and production for charcoal in Zambia. Quantities of charcoal consumed have soared (Figure 1). The number of charcoal kilns produced per person has increased from 2.9 in 2013 to 4 in 2015.

Charcoal Prices, Income, and Expenditures: There has been a steady rise in the charcoal producer prices from 2013 to 2015 (Figure 2). Likewise, Charcoal wholesale and retail prices are soaring (Table 1). While consumer charcoal monthly expenditure has escalated by 65% between 2013 and 2015. The increased demand and supply of charcoal is also reflected in the trends in the transportation modes. Trucks are the most widely used transport as compared to others (See Figure 3).

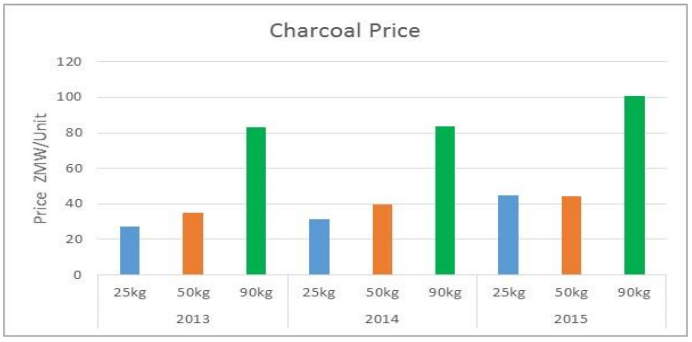
Figure 1. Quantities of Charcoal Consumed (2013-2015)



	2013	2014	2015	2013	2014	2015	2013	2014	2015
	Daily			Weekly			Monthly		
Minimum, kg	0.66	0.66	1.32	1.32	3.3	3.3	0.67	5.28	6.6
Maximum, kg	1.32	1.32	6.6	16.5	33	46.2	132	132	247.5
Mean, kg	0.825	0.99	3.795	5.8212	10.62	17.25	29.09	38.39	63.16

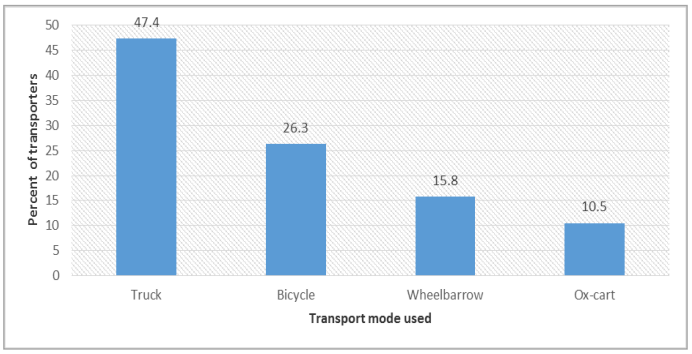
Source: Dlamini et al. 2016a.

Figure 2. Charcoal Producer Prices (2013-2015)



Source: Dlamini et al. 2016a.

Figure 3. Transportation Modes Used in Charcoal Trade



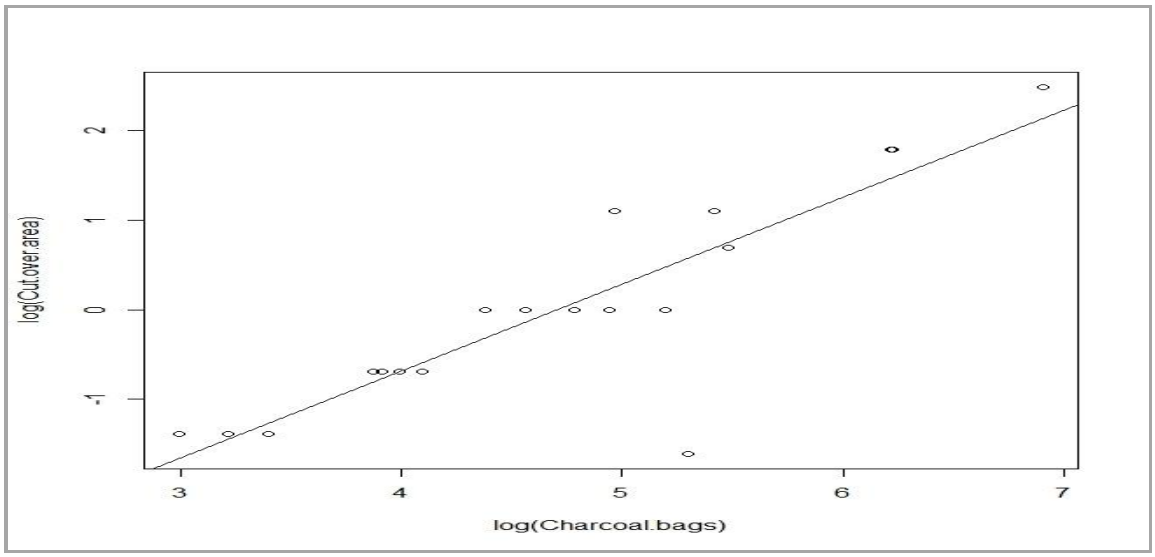
Source: Dlamini et al. 2016a.

Table 1. Trends in Charcoal Wholesale and Retail Prices (2013-2015)

		Size of bag (in Kg's)	Year					
			2013		2014		2015	
			Nominal	Real	Nominal	Real	Nominal	Real
Wholesale price (ZMW)	A	25	14.3	16.9	23	25.3	31.4	31.4
		50	24.1	28.6	32.3	35.5	39.5	39.5
Retail selling Price (ZMW)	B	10	-	-	15	16.5	17.5	17.5
		25	25.8	30.7	30.6	33.7	36.2	36.2
		50	34	40.4	45	49.5	56.4	56.4
		90	85	100.9	107.5	118.4	125	125
Retail margin	(b-a)	25	11.5	13.8	7.6	8.4	4.8	4.8
		50	9.9	11.8	12.7	14.0	16.9	16.9

Source: Dlamini et al. 2016b.

Figure 4. Cutover Area versus Number of Charcoal Bags Produced



Source: Dlamini et al. 2016b.

Status of the Forest in Charcoal Production Sites: There is a direct correlation between the quantities of charcoal produced and the cutover area (Figure 4). Thus, the likely impact of prolonged load shedding in Zambia is likely to lead to more clearing of forests and woodlands. Unlike clearing land for agriculture, this is expected to lead to losses of forest ecosystem functions and forest ecosystem goods and services. However, it is unlikely to lead to losses in biodiversity because in all abandoned charcoal production sites, at regeneration, the subsequent species diversity represents a full range of species that are reminiscent of the Miombo range Figures 5a to 5c).

Figure 5a: Rufunsa - Families and their Relative Species (before Load Shedding)

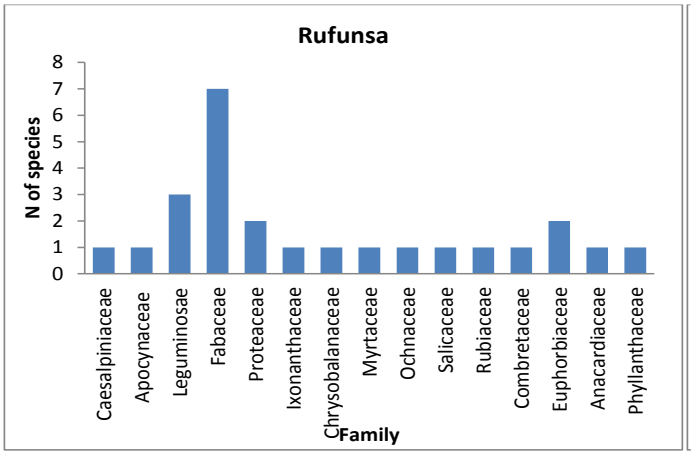


Figure 5b. Choma - Families and their Relative Species (before Load Shedding)

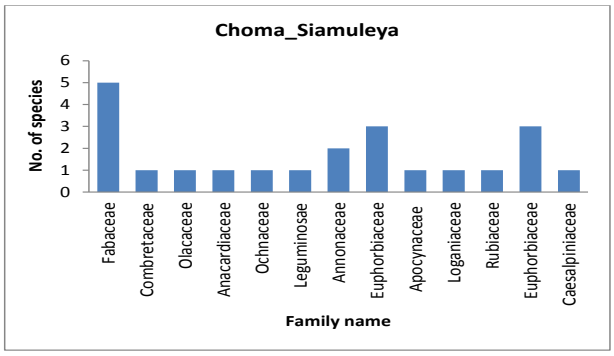
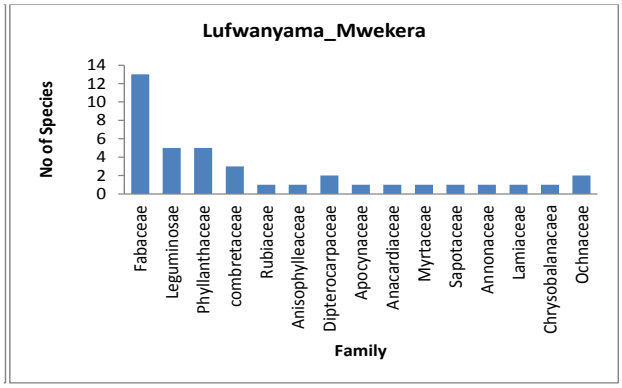


Figure 5c: Lufwanyama - Families and Their Relative Species (before Load Shedding)



Source for Figures 5a-5c: Dlamini et al. 2016b.

CONCLUSIONS/RECOMMENDATIONS:

There is enough evidence from this study and other previous ones that load shedding working through increased demand for charcoal contributed to: a) increased charcoal production and supply to the markets (commercialization); b) soaring consumer prices for charcoal; c) unsustainable forest resource utilization due to increased tree felling and localized deforestation and forest degradation; and d) loss of forest ecosystems functions and associated ecosystem goods and services.

The current dynamics of the charcoal value chain—especially in light of the prevailing load shedding and high demand (in the markets) for charcoal—indicate that economic sustainability of charcoal production and trade is certainly guaranteed, given the high demand for and supply of charcoal, with rising profit margins especially among those traders selling bigger packages. In the long term, this is likely to affect livelihoods of forest dependent communities and other consumers of timber and non-timber forest goods and services in the country, as indiscriminate tree felling implies loss of forest biodiversity and ecosystem services. In view of these developments, we propose the following measures for identified issues if the likely effects are to be minimized going forward:

1. Government should consider accelerating diversification of Zambia's energy mix, as opposed to over-reliance on hydroelectric power. It should also exploit project finance and public private partnerships in renewable energy investments. This will require that the GRZ work towards de-risking the sector to ensure bankability of electricity generation projects in the energy sector. Further, there will be need to resolve the impasse on electricity tariffs, which is the main economic signal that is likely to further trigger investments. The researchers also propose that government should promote and support initiatives for energy efficient/saving technologies, i.e., energy saving stoves, and others among the small industries (restaurants, lodges, etc.) and households to assist in saving energy countrywide.
2. To ensure sustainability in charcoal production, in light of the increasing demand for wood fuel that has been triggered by load shedding, there is a need to understand the dynamics of forest management in the context of sustainable charcoal production and use. As things stand, charcoal production has been shown to stimulate the natural regeneration of Miombo woodlands. This is because charcoal production is a form of forest utilization and if managed properly can contribute towards sustainable livelihoods and rural economy, not only in Zambia, but in many other Miombo ecoregion countries. These observations indicate the need to incorporate charcoal production in forest management programs and the rural economy. Charcoal production, if organized properly, could greatly contribute to the gross domestic product of the Zambia.
3. The poor law enforcement and lack of compliance has resulted in unregulated charcoal production, transformation of primary forests into secondary forests, and degraded woodlands in the country. This was attributed to inadequate staff, compounded by poor capacities of public forest administrations and low budgets for the Forestry Department. Therefore, it is recommended that the GRZ enhance physical, human, and financial capabilities, to help implementation of the Forest Act No. 4 of 2015, which forms the basis for sustainable

natural resource management. In addition, there should be provisions in the legislation for mandatory restoration of areas in which charcoal was formerly produced. Because charcoal producers lack the capacity to comply with policies and legislation, they propose that these be sensitized and trained for them to be self-compliant.

4. Given the under appreciation of traditional forest governance, and poor orientation about local-level institutional arrangements relating to charcoal production and penalties for rule breakers, it is critical that public forest administrators collaborate with the traditional/customary natural resource management institutions to help in sustainable natural resource use. This is important as the forestry management systems are embedded within the traditional institutions. Moreover, two-thirds of Zambia's forest area falls under customary land. Government and cooperating partners need to conduct a pilot project of decentralized forest and other national resources management.
5. To save energy, there is need to enhance cooperation between local authorities and consumers to increase the adoption and the use of energy saving technologies among consumers.

Finally, this study forms the basis of a systematic study to investigate the implications of load shedding, charcoal use, and associated impacts on the natural forests and woodlands in charcoal abandoned areas in Zambia and, perhaps, in Sub-Sahara Africa. Further studies on the actual contribution of load shedding to charcoal production and forest degradation are urgently needed to provide a basis for meaningful policy interventions.

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