

Economic Effects of Load Shedding on Small and Medium Enterprises in Kalingalinga and Ibex Hill

Vusumuzi Muleya^a, Gwebente Mudenda^{b*}

^{ab}School of Social Sciences, Department of Economics, ZCAS University, Zambia

ABSTRACT

This paper aims to analyze the economic effects of load shedding on Small and Medium Enterprises (SMEs) in Kalingalinga and Ibex Hill based on four underlining parameters: Operational capacity, employment, revenue and adopted mitigation strategies. Previous studies conducted lacked geographical specificity, particularly in the context of Zambia's urban and pre-urban areas, the study aimed at addressing this gap. Load shedding continues to be a critical and persistent challenge in Zambia. There are several factors that have led to this challenge, which include a high dependency on hydroelectric power. Thus, the supply of power is subject to weather conditions and the drought experienced in 2024 worsened the condition. Loadshedding has a significant adverse effect on Small and Medium Enterprises (SMEs) which contribute 70% to the Gross Domestic Product (GDP) and account for 88% of the national employment. Therefore, any adverse economic effect on SMEs is critical to the overall economic position of the country. The findings inform various stakeholders, including policymakers and business owners, which provide a basis for developing effective mitigation strategies against the adverse effects of loadshedding. The authors conducted the study based on a quantitative methodology which employed a deductive approach guided by a positivism philosophy. Data was collected from a sample of 50 SMEs between December 2024 and February 2025. The Seemingly Unrelated Regression (SUR) model was utilized to examine the relationship between the frequency of power outages and the dependent variables, which included reductions in operational capacity, revenue, and employment. The results of the study indicate that an increase in the frequency of load shedding has a direct and statistically significant negative impact on SME performance. Particularly, for every one-unit increase in outage frequency, there was a corresponding reduction in operational capacity, a significant decrease in revenue (with most businesses reporting a loss of approximately 50% of income during outages), and a consequential reduction in employment levels. Although 90% of SMEs implemented mitigation strategies such as the use of generators and solar power, 78% found them to be only moderately effective due to their high cost, which affected profitability. The study concludes that load shedding adversely affects SMEs as their going concern and growth are hindered by this challenge. The operational capacity, financial health and employment were all negatively affected. The high costs and limited effectiveness of current mitigation strategies exacerbate these challenges. The findings call for the urgent need for a multi-faceted approach, including government subsidies for renewable energy and improved national infrastructure, to build economic resilience against energy instability and protect the livelihoods supported by SMEs.

Article history:

Received 02 June 2025

Revised 30 June 2025

Accepted 27 July 2025

Available online 7 Oct 2025

Correspondence authors:

vu.muleya@gmail.com

gwebente.mudenda@zcasu.edu.zm

KEYWORDS: Load shedding, Operational Capacity, Revenue, Mitigation

Introduction

Load Shedding is the deliberate shutdown of electricity in parts of a power-distribution system. This challenge is not unique to Zambia but has clutched many developing countries. However, the frequency and magnitude of the power outages in Zambia has significantly increased due to several factors. Some of

which include high dependency on hydroelectric power, which is solely dependent on water levels that are subject to rainfall patterns. Depreciated infrastructure that failed to efficiently distribute the available electricity (International Energy Agency, 2020) and the drought experienced by the country in 2024 which led to prolonged power outages from 3 to as high 21 hours of no electricity. The above stated are

some of the contributing factors to load shedding. Electricity supply is a critical aspect of economic performance for Small and Medium Enterprises (SMEs) in sub-Saharan Africa. Particularly in Zambia, SMEs contribute 70% towards the nation's Gross Domestic Product (GDP) and account for 88% of the employment (Ministry of Small & Medium Enterprise Development, 2023). Therefore, any adverse economic effect on SMEs could have a devastating effect on the overall economy of the country.

Kalingalinga and Ibex Hill are neighborhoods within Lusaka that have experienced both a rise in economic activity as well as an increase in load shedding. The contrast between the two focus areas presented a dynamic understanding of the effects as Kalingalinga can be classified as a low-medium income area with a highly dense population while Ibex Hill is a medium-high income area with a moderate population. The mixture of an Urban and peri-urban area allows for a broad and yet dynamic perspective of the economic effects.

The economic effects of load shedding in these areas were profound. Study indicated that load shedding could have led to reduced business hours, loss of perishable goods, decreased productivity, and ultimately, loss of income and jobs (USAID, 2017). In order to analyze the economic effects of load shedding on SMEs in Kalingalinga and Ibex Hill, the authors focused on four main parameters: Operational capacity, financial health, employment and mitigation strategies.

The findings of the study informed policy makers and influenced their decision-making, as well as business owners about best practices on how to overcome the adverse effects of loadshedding. Furthermore, the effect on employment contributed to a better understanding of the broader economic implications including job security and family livelihoods.

Literature Review

The literature reviewed in this section focused on several key terms which included but were not limited to load shedding, SMEs and economic effect. The literature reviewed was segmented as global, regional and national.

Global Literature

Mendoza and Santos (2022) conducted a study based on 49 SMEs in Metro Manila. Their research was based on the effect of power outages on the SMEs in relation to their employment and financial health. The study utilized the Seemingly Unrelated Regression (SUR) with the occurrence as independent variables against the dependent variables being weekly output hours (employment) while turnover and costs for financial health. The results were as follows:

Employment: 58% of SMEs reported shift reductions as every added twenty-four hours was related to a 12% decrease in output hours ($\beta = -0.12, p < 0.01$).

Financial Performance: Profit margins significantly dropped by 18% per outage day ($\beta = -0.18, p < 0.001$). Simultaneously, the dependency on generators as a mitigation strategy resulted in a rise in costs between 22% to 30%.

The SUR model was used as it correlated errors between employment and financial equations (Breusch-Pagan $p = 0.003$), which established its appropriateness over isolated regressions.

The results firmly indicate that load shedding gravely weakens SME sustainability through concurrent and interconnected losses in workforce productivity and revenue, with current alternative solutions demonstrating to be financially unsustainable. Global research summarizes the economic effects of load shedding on (SMEs). However, there's still a need for detailed studies that should focus on human and social costs of loadshedding, regional differences on the various effects of load shedding, the need for policy and technological implementation as a solution. Tackling these gaps will assist in contributing tangible and feasible strategies to mitigate the adverse effects of power outages in vulnerable communities.

Continental Literature

On the African continent exists a heavy reliance on energy to conduct various economic activities, coupled by infrastructural challenges which results in erratic supply of electricity. A study conducted by The African Development Bank (AfDB) (2019) highlights unstable power supply as a major hinderance to economic growth, especially for SMEs, which are imperative to employment and GDP contribution. The AfDB report findings emphasize that power outages possess a directly proportional relationship with operational costs, business inefficiency, and even the risk of going concern. These issues cumulatively increase the cost of living for societies that depend on these enterprises for goods, services, and jobs. A critical matter of concern identified by the AfDB (2019) is that for SMEs in Africa, the impact of load

shedding is disproportionately incomparable to larger corporations. This is because SMEs do not possess the same financial resources as larger corporations to acquire adequate power solutions. In the absence of reasonably priced and sustainable energy alternatives, these businesses are subject to significant output losses during load shedding. A typical example is the manufacturing industry which are prone to power interruptions, resulting in material spoilage, delayed deliveries, and lost revenue. The economic ripple effect of these inefficiencies is ultimately passed on to consumers through higher costing measures in the prices for the products and services rendered. Ultimately increasing the general cost of living and affecting the economic stability of entire areas.

The continental literature evidently establishes the heavy economic burden that load shedding places on African SMEs and society at large. Regardless, further targeted research is required to investigate long-term handling strategies, the prospect of renewable energy sector, and the various effects and impact on different demographic groups. These insights could help policymakers and stakeholders develop more effective strategies to support SMEs, reduce the cost of living, and foster economic resilience in the face of energy challenges.

Regional Literature

A comprehensive study conducted by Chakraborty et al. (2020) on the economic impact of load shedding in Southern Africa, noted its devastating consequences on production and manufacturing. The findings showed that SMEs in the production-based industry experience intense operational challenges during load shedding, including manufacturing stops, equipment damage, and thus an increase in maintenance and fixing costs. Thus, a reduction in effective operating hours, failure to meet operational capacity, loss of revenue and a deduction in profit margins. An important finding noted that a rise in production cost due to the implementation of alternative solutions leads to an increase in pricing to the end consumers (Kumar & Sikalumbi, 2025). The study reflects how the financial impact expands beyond the SMEs but the economy as a whole and negatively affecting the purchasing power as well as quality of life in the region.

Regional literature provides a well-rounded understanding of how load shedding disrupts economic activities and exacerbates the cost of living across Southern Africa. However, more research is needed to address the social dimensions of energy instability, evaluate the effectiveness of regional energy strategies, and explore innovative, sustainable solutions for SMEs. Addressing these gaps could pave

the way for more comprehensive and practical approaches to mitigating the negative effects of load shedding on the regional economy.

National Literature

The University of Zambia (2021) research uncovers that load shedding rigorously effects SMEs dependent on continuous power supply. These businesses encounter output disturbances, hence, procrastinating projects and lowering product quality. Such as manufacturing firms suffering machinery failures and undelivered orders, while the service industry struggles to sustain customer service without power. Therefore, this leads to a drop in sales and reduced sales margins because of the high cost of alternative energy solutions like generators and fuel costs.

The national literature on the economic effects of load shedding on SMEs in Zambia shows severe challenges that affect the continuity and growth of SMEs. While existing studies point out the operational, financial, and social effects of loadshedding, tackling the stated gaps through additional study could present enhanced effective policy frameworks, support mechanisms, and new power solutions. These developments would be essential in encouraging economic resilience and improving the cost of living for Zambians, ultimately contributing to a better and healthy economy.

Theoretical Framework

The theoretical framework for analyzing the economic effects of load shedding on SMEs in Kalingalinga and Ibex Hill involved several economic theories that explained the relationship between availability of power, operational capacity, and economic results. The primary theories applied in this research included the Economic Cost of Power Outages Theory, the Resource-Based View (RBV) of the firm, and the Dependency Theory. Each of these theories provided a distinct perspective on how power disruptions affected business operations and economic stability.

Economic Cost of Power Outages Theory

Economic theory suggests that load shedding results in costs on businesses, thus affecting the economy all together. This theory aids us to comprehend the immediate financial hit to SMEs from load shedding and its varied effects on the economy. Fisher (2015) further describes how frequent power outages can raise operational costs and shrink profits, ultimately hindering economic growth and development.

Resource-Based View (RBV) of the Firm

The Resource-Based View (RBV) of the firm emphasizes the importance of resources in achieving competitive advantage and sustainable business performance. Under this framework, electricity is considered a critical resource that influences the efficiency and productivity of SMEs. When firms possess uninterrupted power supply, they are more likely to innovate and improve their competitive positioning. Conversely, frequent load shedding can deplete a firm's resources and weaken its competitive edge. Barney (1991) provides a detailed analysis of how resource availability influences organizational capabilities and competitive outcomes.

Dependency Theory

Dependency Theory was used to explain the relationship between developed and developing economies and can be extended to understand the dependency of SMEs on a stable power supply. This theory argues that economic conditions in developing regions are often shaped by external influences and internal vulnerabilities, such as unreliable infrastructure. Load shedding exemplifies an infrastructural vulnerability that impacts SMEs' ability to function independently and prosper. Dependency on a reliable power supply is critical for maintaining operational continuity and economic independence. Smith (2018) explores how dependency on unreliable energy sources can retard economic growth and exacerbate economic disparities.

Conceptual Framework

Figure 1 Conceptual Framework

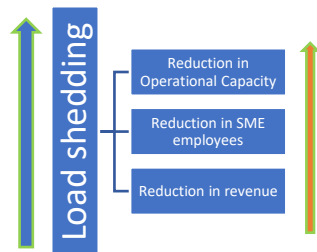


Table 1: Independent and Dependent Variables

Independent Variables	Dependent Variables
Load shedding	Reduction in Operational Capacity
	Reduction in SME employees
	Reduction in Revenue

Methodology

This section of the research outlined the methodology adopted to investigate the economic effects of load shedding on SMEs in Kalingalinga and Ibex Hill. The research onion (Saunders, Lewis & Thornhill, 2016) was used as a guide for the construction of the research framework. The choice of methodology was pivotal to ensure the reliability and validity of the study's findings. It involved detailed research design, study site, population, sampling techniques, data collection instruments, and methods of data analysis. The methodology aimed to provide a systematic, replicable framework for gathering and analyzing data to answer the research questions posed in the study (Kothari, 2004; Sikalumbi, 2023).

Underlying Philosophy

Positivism is a research philosophy that uses scientific methods to study the social world. It is based on the idea that knowledge is derived from objective, observable, and measurable facts. The researcher aims to discover universal laws and cause-and-effect relationships, much like in the natural sciences (Jannsen, 2023). Data was gathered using questionnaires in this study.

Research Approach

The deductive approach was used in this study. This research strategy starts with a general theory which is used to develop a testable specific hypothesis. It aims to confirm or dismiss an existing theory with empirical evidence. It is a structured and systematic process, most associated with quantitative research. The deductive was drawn from the primary data collected.

Time Horizon

The study was cross-sectional in nature with data being collected between December 2024 and February

2025. No data for this study was collected before or after this period.

Research method and Justification

The study employed a quantitative research approach that provided an analysis of the effects of load shedding. The strategy enabled quantitative data to provide a broad generalization of the effects (Creswell, 2013). This approach was suitable for capturing the effects of load shedding on SMEs. To achieve a deeper understanding of Phenomena by quantifying variables and relationships, the quantitative research approach is the most suitable for a study such as this (Ghanad 2023; Sikalumbi et. Al, 2025).

Sampling frame and sample size

The participants of the study were selected using the stratified random sampling technique to ensure each SME category (retail and services) was proportionately represented. Additionally, purposive sampling was used for selecting key informants like government officials and utility representatives to gather specific insights into policy and management strategies. Eligible participants were those who had operated an SME for at least one year, which ensured they experienced the effects of load shedding sufficiently to provide informed responses. Purposive sampling is an appropriate sampling technique to implore for small samples (Saunders, Lewis, & Thornhill, 2016). The sample size for the study was 50 SMEs from in Kalingalinga and Ibeex hill.

Data collection and analysis

The data was collected using face to face interviews, questionnaires with both closed-ended and open-ended questions as well as reviewed existing literature, industry reports, energy audit documents, and government publications. Quantitative data from questionnaires were coded in Statistical Package for the Social Sciences (SPSS) software 20 which enabled detailed statistical analysis to generate frequencies of variables. Further, STATA 14 was used for regression analysis using the data coded from SPSS. Regression Analysis is used to examine the relationship between a dependent variable and one or more independent variables (Sarstedt, 2014). Excel was used for graphical presentations.

Reliability, Validity and Generalisability of Research Findings

In quantitative research, reliability and validity are two key concepts that are used to evaluate the quality and trustworthiness of a measurement instrument or method (Noble & Smith, 2015). Validity of the instruments was ensured through reviews and pilot testing while reliability was assured through consistent data collection procedures and triangulation of data sources. The study aimed for generalizability by selecting a diverse sample across different types of SMEs.

Findings

The findings showed that all SMEs that participated experience load shedding daily. This gave a 100% response rate on the experience of loadshedding. The outcome was favourable for the study because it ensured that all SMEs gave information from recent experience providing confidence to their responses.

Regression Analysis

This section will outline the regression analysis results from SUR model. The tests results are provided in appendix II.

Table 2: Seemingly Unrelated Regression Output (Results)

```
. sureg ( Operational_Capacity_Impact frequency_of_loadshedding_1 ) ( Revenue_Impact_2 frequency_of_loadshedding_1 ) ( Employment_Impact frequency_of_loadshedding_1 )
```

Seemingly unrelated regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Operational_Capacity-Impact	49	1	.1277753	0.1833	11.00	0.0009
Revenue_Impact_2	49	1	.3871786	0.1894	11.45	0.0007
Employment-Impact	49	1	.5905094	0.1315	7.42	0.0065

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Operational_Capacity-Impact						
frequency_of_loadshedding_1	.2	.0603023	3.32	0.001	.0818097	.3181903
_cons	1.6	.1158977	13.81	0.000	1.372845	1.827155
Revenue_Impact_2						
frequency_of_loadshedding_1	.6181818	.182725	3.38	0.001	.2600474	.9763163
_cons	.5818182	.3511877	1.66	0.098	-.106497	1.270133
Employment_Impact						
frequency_of_loadshedding_1	-.7590909	.2786849	-2.72	0.006	-1.305303	-.2128785
_cons	3.359091	.5356175	6.27	0.000	2.3093	4.408882

The Table above shows the regression output(results) using SUR model. From the Table it is evident that the variables operational capacity, revenue impact and

employment are all significant. This is due to their P-value being lower than 0.05 (test for significance). Based on the results in the Table, for every one-unit increase in the frequency of loadshedding, operational capacity is estimated to increase by 0.2 units (operating at below optimal level), and revenue impact (reduction) is estimated to increase by about 0.618 units. In contrast, an increase in loadshedding frequency causes a decrease in employment impact by approximately 0.759 units, which corresponds to negative effects on employment such as job losses. All these relationships are statistically significant.

Frequency of SMEs, Years of Operation and Industry Operation

Majority of the survey participants were predominantly from the service industry (64%), followed by the retail industry (34%), and lastly, the beauty and cosmetics industry (2%). This distribution suggests that most of the SMEs in the study are from the service sector.

The findings indicated that the majority of SME's that participated in the study operated their business between one year and three years giving a 68% participant rate. Further, the year range of 4 – 6 years had a participation rate of 24% while less than 1 year had 3% and the least having 2% for SMEs operated above 6 years. The findings depicted that the captured participation rate was well represented having a rate of over 68% operated their SMEs for over a year.

Most of the SMEs surveyed (76%) employ between 1 and 5 people. A smaller portion of the businesses have 6 to 10 employees (18%), while companies with 11 to 20 employees and those with more than 20 employees each represent only 2% of the total. This indicates that most SMEs in Ibex and Kalingalinga are very small businesses

The findings showed that all SMEs that participated experience load shedding daily. This gave a 100% response rate on the experience of loadshedding. The outcome was favorable for the study because it ensured that all SMEs gave information from recent experience providing confidence to their responses.

Describe the Effects of load shedding on the operational capacity of SMEs in Kalingalinga and Ibex Hill

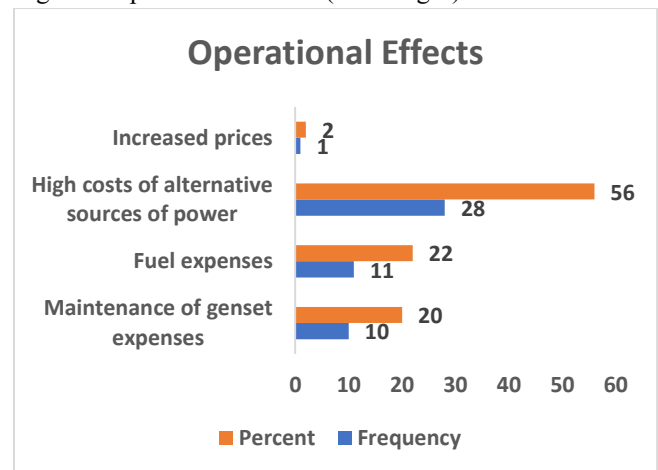
Loadshedding has had a significant impact on business operations, with 62% of SMEs reporting a significant

influence. Another 32% were moderately affected, and 4% were completely affected. Only a small portion of SMEs (2%) were not affected at all.

Loadshedding significantly impacted the operational capacity of SMEs. Most SMEs (90%) reported a reduction in their optimal operational level due to loadshedding. In contrast, only 10% of SMEs stated that loadshedding had no effect on their operational capacity, allowing them to continue operating at optimal levels (Hamilandu & Sikalumbi, 2025).

The most significant effect of loadshedding on SMEs is the increase in the cost of alternative power, which affects their operational efficiency (56%). Additionally, SMEs are facing higher fuel expenses (22%) due to increased fuel prices for their generators, and an increase in maintenance expenses for those generators (20%).

Figure 2 Operational Effects (Challenges)



Business Aspect Affected

Service delivery businesses are the most heavily affected by loadshedding in Ibex and Kalingalinga, accounting for 60% of the affected SMEs. This includes businesses like barbershops and salons. Meanwhile, SMEs involved in goods storage were affected at a rate of 14%, and those in production were the least impacted at just 5%.

Table 3: Business Aspect Affected

Business Aspect Affected	Frequency	Percentage

Customer relations	8	16.0%
Production	5	10.0%
Service delivery	30	60.0%
Storage of goods	7	14.0%
Total	50	100.0%

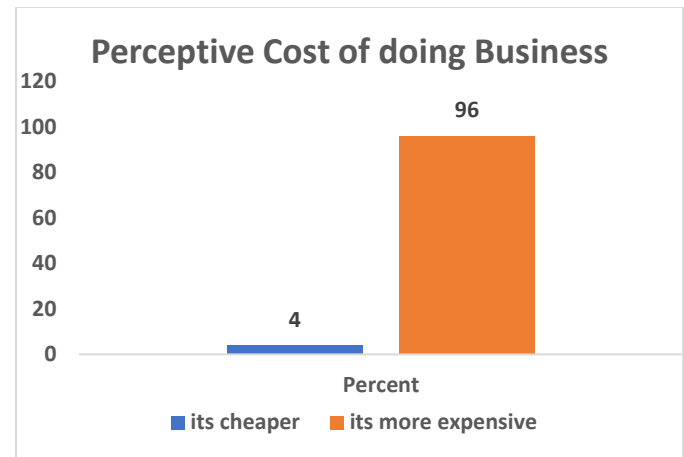
Impact of Loadshedding on the financial health of SMEs (operational costs and lost revenue)

The study findings depicted that SMEs significantly face an increase in operational costs with the frequency of loadshedding. This was represented by 56% SMEs responses. Further, 42% were of the view that loadshedding moderately led to the increase in costs of operations.

The study findings revealed that SME's experience a decrease in sales during loadshedding. This was represented by 74% of responses from SME's operating in Ibex and Kalingalinga. On the other hand, only 26% of SME's were of the view that loadshedding does not reduce their sales.

A participant rate of 96% were of the view of it being expensive to do business during loadshedding. The cost of doing business during loadshedding was attributed to the cost of fuel for the genset. On the other hand, only 4 % were of the view of it being cheaper to do business during load shedding.

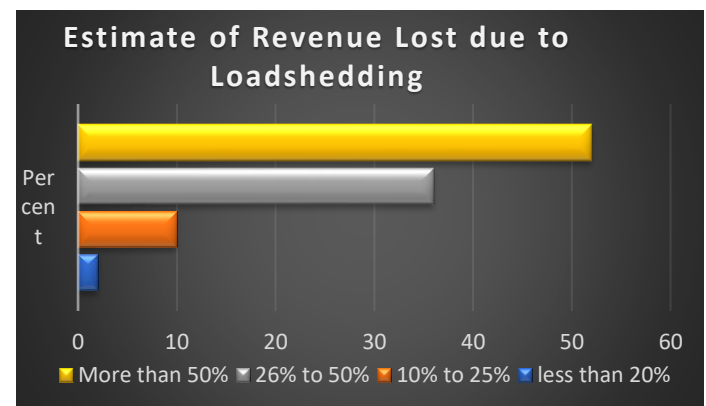
Figure3: Perceptive Cost of Doing Business during load shedding



Estimation of Revenue lost due to load shedding

The findings showed that majority of SMEs lose about 50% of their revenue during the time of loadshedding. Further, a minority of the SMEs were of the view that they only lose about 20% of their revenue during loadshedding.

Figure 1: Estimate of Revenue Lost due to Loadshedding



Strategies SMEs employ to mitigate the effects of load shedding

Most SMEs implement alternative power outages strategies, this was represented by 90% of the SMEs. On the other hand, only 10% of SMEs did not implement any other strategies (Kayangula & Sikalumbi, 2025).

The strategies used by SMEs to cope with loadshedding in Ibex and Kalingalinga primarily involve adopting alternative power sources. The most

common strategy is installing solar power (43%), followed by using generators (30%). Additionally, 17% of SMEs use rechargeable equipment to maintain workflow. Adjusting working hours was the least-used strategy, with only 10% of businesses adopting it. These findings indicate that SMEs must invest in alternative energy to operate effectively during power outages, despite the high costs.

The majority of the SME's echoed that the strategies implemented are moderately effective, this covered a representation of 78%. Further, only 16% were of the view that the strategies were slightly effective and 4% of the view that they were highly effective.

Figure 4: Strategies Implemented

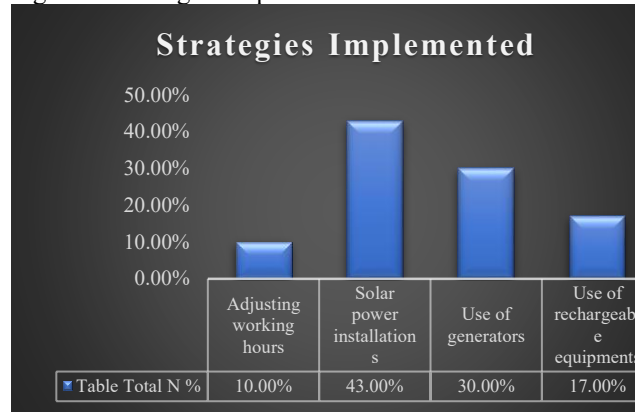


Figure 5: Effectiveness of Strategies Implemented



What was the impact of load shedding on employment within SMEs in the studied areas?

Most SMEs dealt with prolonged loadshedding by reducing the number of employees (66%). A smaller number of businesses (26%) maintained the same number of employees. Interestingly, 4% of SMEs felt

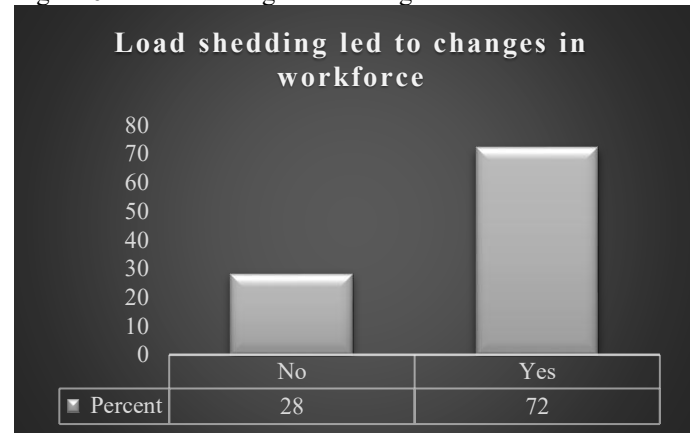
that increasing staff during these times would be beneficial.

Most of the SMEs surveyed (72%) reported that loadshedding necessitates changes in their workforce. In contrast, 28% of the businesses believed that no changes to the workforce were needed, even during continuous, prolonged periods of loadshedding. The findings showed that the majority of the SME's were of the view that loadshedding had a 10% to 25% impact on their workforce. This was represented by 70% response rate.

Table 4: Load Shedding Effecte on SME Employment

Load shedding effect on the employment rate	Frequency	Percent
The number of employess has remained the same	13	26.0
we have had to increase the number of employees	4	8.0
We have to reduce the number of employees	33	66.0
Total	50	100.0

Figure 6: Load shedding led to changes in workforce



Overall findings

The results indicate that loadshedding negatively affects the economic landscape of SMEs in Kalingalinga and Ibex hill based on the four parameters of Operational Capacity, Financial Health, employment as well as the mitigation strategies employed due to their high costs.

Research limitations/implications

While several helpful findings were identified from the study, there were some limitations experienced such as geographical constraints and temporal limitations. The research was confined to SMEs in Kalingalinga and Ibex Hill, Lusaka, this means the findings may not be applicable to businesses in other areas with different economic or infrastructural conditions. The study was also conducted over a 3-month period, limiting the ability to assess the longer-term impacts of load shedding on business viability, employment, and wider economic shifts.

Additionally, gathering data from unregistered businesses that lacked financial records was a challenge and some SME owners did not wish to disseminate sensitive financial related information. Lastly, the study did not fully account for external influences that could affect the results, such as government policies, changes in the macroeconomic environment, or global economic events.

Recommendations

These are recommendations based on the findings of the study. Investing in Alternative Power Sources such as solar power, use energy-efficient generators, and rely on rechargeable equipment to maintain basic operations during power outages. Secondly, Government and Policy bodies should be strengthened. Authorities can help by subsidizing renewable energy solutions, offering tax breaks for businesses that invest in backup power, and improving the national electricity infrastructure. Additionally, business operations should be adjusted. SMEs can build resilience by making working hours align with power availability, creating back-up plans for outages, and identifying co-working spaces with stable electricity. Smart Financial Planning also enables businesses to diversify their revenue streams, share the cost of energy solutions with other similar businesses, and seek affordable financing like low-interest loans. Supporting employees by introducing flexible work arrangements, training them on manual operations, and maintaining a highly skilled workforce will improve efficiency. Lastly, SMEs should promote energy efficiency by reducing their dependence on unreliable power. This can be implemented by offering training on energy-saving practices, using energy-efficient appliances, and consulting with experts to optimize power use.

References

- Ackah-Baidoo, A. (2016). Energy crisis and its effect on small-scale industries in Ghana. *Journal of Energy and Natural Resource Management*, 3(1), 1-9.
- African Development Bank. (2018). *Economic Impact of Power Problems in Zambia*. Retrieved from [AfDB Documents]
- African Development Bank. (2018). *Economic Reports on Zambia*. [AfDB Publications]
- African Development Bank. (2019). *Powering Africa: Meeting the continent's electricity needs*. AfDB Publications.
- Amoah, A., Larbi, D. A., Offei, D., & Panin, A. (2017). In gov we trust: the less we pay for improved electricity supply in Ghana. *Energy, Sustainability and Society*, 7(1), 1-9
- Aryeetey, E. (2001). *Priority Research Issues Relating to Regulation and Competition in Ghana*. Accra: Institute of Statistical, Social and Economic Research, University of Ghana.
- Banda, J., & Phiri, M. (2020). *Operational challenges faced by small-scale entrepreneurs during load shedding: A case study of Kitwe District*. Kitwe: Copperbelt University Press.
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Chakraborty, S., & Gupta, N. (2017). Electricity outage and its impact on small businesses. *Journal of Urban Management*, 6(2), 46-58.
- Chakraborty, S., et al. (2020). The economic impact of load shedding in Southern Africa. *African Economic Review*, 22(1), 98-115.
- Chisanga, C., Mulenga, G., & Tembo, G. (2019). *The impact of load shedding on small and medium enterprises in Zambia*. Lusaka: *Zambian Journal of Economics*.
- Creswell, J. W. (2013). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- Economic Commission for Africa. (2020). *Economic effects of load shedding in Africa*. ECA Policy Brief.
- Energy Regulation Board (ERB). (2017). *Impact of Loas shedding on Small Scale Entreprises*. Lusaka: ERB Publications.

- Fisher, E. (2015). The economic impact of electricity outages: A focus on businesses. *Energy Economics*, 49, 277-286.
- Hamilandu, K., & Sikalumbi, D. A. (2025). Influence of Social Networks on In-Service Teachers' Intentions to Start Businesses in Chongwe District of Zambia. *Journal of Entrepreneurship and Project Management*, 10(3), 52–65. <https://doi.org/10.47941/jepm.3078>
- International Energy Agency. (2020). Energy Access Outlook Report. [IEA Publications]
- International Energy Agency. (2020). Energy Report on Sub-Saharan Africa. Retrieved from [IEA Publications]
- International Monetary Fund (IMF). (2019). Zambia Economic Development Report. Retrieved from [IMF Publications]
- International Monetary Fund. (2019). World Economic Outlook: Challenges to Steady Growth. IMF Publications.
- Vincent Kayangula, Dewin Arona Sikalumbi. (2025) An Investigation of Factors Influencing the Growth of Financial Literacy Among Small Scale Traders in The Central Business District of Lusaka. *International Journal of Innovative Technologies in Social Science*. 3(47). Doi: 10.31435/ijitss.3(47).2025.3497
- Khanal, S., Sharma, R. and Bhattarai, P. (2024) 'Renewable energy adoption and operational resilience in Nepalese SMEs', *Energy for Sustainable Development*, 78, pp. 101368.
- Kumar, N. B., & Sikalumbi, D. A. (2025). Factors Affecting the Adoption of Renewable Energy (Solar) in Rhodes Park Area of Lusaka District, Zambia. *Journal of Climate Policy*, 4(1), 72–86. <https://doi.org/10.47941/jcp.3050>
- Kothari, C. R. (2004). Research Methodology: Methods and Techniques. New Age International.
- KPMG. (2018). Zambia Country Profile. Retrieved from [KPMG website]
- Krejcie, R. V., & Morgan, D. W. (1970). Determining Sample Size for Research Activities. *Educational and Psychological Measurement*.
- Mbewe, A., & Tembo, G. (2022). Financial strain and coping strategies among smallholder agricultural enterprises in Zambia. Lusaka: *Zambian Agricultural Review*.
- Mendoza, R.B. and Santos, M.L. (2022) 'Employment and financial impacts of power outages on Philippine SMEs', *Energy Economics*, 112, pp. 106118.
- Mensah, J. (2019). Coping with power unreliability: Strategies of SMEs in Ghana. *Energy Policy*, 129, 1102-1109.
- Mensah, J. V., Tribe, M., & Weiss, J. (2019). The small-scale manufacturing sector in Ghana: A source of dynamism or of subsistence income? *Journal of African Economies*, 28(1), 53-76.
- Ministry of Finance, Zambia. (2022). Annual Economic Report: Impact of Load Shedding on Zambian SMEs. Government of Zambia.
- Mulenga, G., Chisanga, C., & Mbewe, A. (2021). Coping mechanisms for SMEs during power outages: Evidence from Lusaka's low-income areas. Lusaka: *Journal of African Business Studies*.
- Muthuswamy, S. (2022). Role of Microfinance Institutions on the Financial Performance of Small and Medium Enterprises in Lusaka, Zambia: A Case of Kalingalinga Compound, Zambia.
- Naing, L., Winn, T., & Rusli, B. N. (2006) in the study "Practical issues in calculating the sample size for prevalence studies." *European Journal of Epidemiology*, 21(2), 129–134
- Ndlovu, T., & Moyo, S. (2021). The economic impact of load shedding on SMEs in South Africa. Johannesburg: *South African Journal of Economics*.
- Sikalumbi Arona Dewin (2023). Success in research, the researcher's companion, Printgraphix Zambia, Lusaka.
- Dewin Arona Sikalumbi, Jonas Simbeye, Beatrice Chirwa. (2025) Exploring Ethical and Cultural Factors Influencing Participation in Snowball Sampling Studies. *International Journal of Innovative Technologies in Social Science*. 3(47). doi: 10.31435/ijitss.3(47).2025.3494
- Singh, A., & Mahanty, B. (2017). Impact of power outages on SMEs & economy. *Journal of Power Systems*, 12(3), 234-241.
- Smith, K. (2018). Dependency and development: The case of energy infrastructure. *Global Development Review*, 22(4), 45-65.

- Southern African Development Community. (2021).
Economic impact of energy instability in SADC.
SADC Reports.
- Suresh, K., & Chandrashekara, S. (2012). Sample
size estimation and power analysis for clinical
research studies. *Journal of Human Reproductive
Sciences*, 5(1), 7-13.
<https://doi.org/10.4103/0974-1208.97779>
- United Nations Development Programme. (2021).
Reports on Sustainable Development Goals and
Energy Access. [UNDP Reports]
- United Nations Development Programme. (2021).
Socio-economic Impact of Energy Issues in
Zambia. Retrieved from [UNDP Reports]
- University of Zambia. (2021). Economic impact of
load shedding in Lusaka. Lusaka: UNZA Press.
- USAID. (2017). Impact of Power Outages on SMEs
in Zambia. Retrieved from [USAID Documents]
- World Bank. (2018). Global economic prospects: The
impact of utility failures on economic activity.
World Bank Publications.
- World Bank. (2020). Energy Sector Management
Assistance Program (ESMAP) Reports. [World
Bank Publications]
- World Bank. (2020). Strategies for Improving Power
Supply in Zambia. Retrieved from [World Bank
Reports]
- World Bank. (2020). Promoting Entrepreneurship in
Zambia. Retrieved from [World Bank Reports]
- Zambia Chamber of Commerce and Industry. (2019).
Annual Business Report on the Impact of Energy
Challenges. [ZCCI Reports]
- Zambia Chamber of Commerce and Industry. (2019).
Impact of Energy Deficit on Zambia's Economy.
Retrieved from [ZCCI Reports]

Appendix II: Test Results

Breusch-Pagan (for SUR)

```
. sureg ( Operational_Capacity_Impact frequency_of_loadshedding_1 ) ( Revenue_Impact_2 frequency_of_loadshedding_1 ) ( Employment_Impact frequency_of_loadshedding_1 ), corr
```

Seemingly unrelated regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Operationa~t	49	1	.1277753	0.1833	11.00	0.0009
Revenue_Im~2	49	1	.3871786	0.1894	11.45	0.0007
Employment~t	49	1	.5905094	0.1315	7.42	0.0065

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Operational_Capacity~t						
frequency_of_loadshe~1	.2	.0603023	3.32	0.001	.0818097	.3181903
_cons	1.6	.1158977	13.81	0.000	1.372845	1.827155
Revenue_Impact_2						
frequency_of_loadshe~1	.6181818	.182725	3.38	0.001	.2600474	.9763163
_cons	.5818182	.3511877	1.66	0.098	-.106497	1.270133
Employment_Impact						
frequency_of_loadshe~1	-.7590909	.2786849	-2.72	0.006	-1.305303	-.2128785
_cons	3.359091	.5356175	6.27	0.000	2.3093	4.408882

Correlation matrix of residuals:

	Operational_Capacity_Impact	Revenue_Impact_2	
Operational_Capacity_Impact	1.0000		
Revenue_Impact_2	0.0825	1.0000	
Employment_Impact	0.1623	0.3684	
	Employment_Impact		
Employment_Impact	1.0000		

Breusch-Pagan test of independence: chi2(3) = 8.275, Pr = 0.0407

Wald Test

```
. sureg ( Operational_Capacity_Impact frequency_of_loadshedding_1 ) ( Revenue_Impact_2 frequency_of_loadshedding_1 ) ( Employment_Impact frequency_of_loadshedding_1 )
```

Seemingly unrelated regression

Equation	Obs	Parms	RMSE	"R-sq"	chi2	P
Operationa~t	49	1	.1277753	0.1833	11.00	0.0009
Revenue_Im~2	49	1	.3871786	0.1894	11.45	0.0007
Employment~t	49	1	.5905094	0.1315	7.42	0.0065

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
Operational_Capacity~t						
frequency_of_loadshe~1	.2	.0603023	3.32	0.001	.0818097	.3181903
_cons	1.6	.1158977	13.81	0.000	1.372845	1.827155
Revenue_Impact_2						
frequency_of_loadshe~1	.6181818	.182725	3.38	0.001	.2600474	.9763163
_cons	.5818182	.3511877	1.66	0.098	-.106497	1.270133
Employment_Impact						
frequency_of_loadshe~1	-.7590909	.2786849	-2.72	0.006	-1.305303	-.2128785
_cons	3.359091	.5356175	6.27	0.000	2.3093	4.408882

```
. test
```

```
( 1) [Employment_Impact]frequency_of_loadshedding_1 = 0
      chi2( 1) = 7.42
      Prob > chi2 = 0.0065
```

VIF (per equation)

```
. reg ( Revenue_Impact_2 frequency_of_loadshedding_1 )
```

Source	SS	df	MS	Number of obs	=	50
Model	1.62	1	1.62	F(1, 48)	=	9.72
Residual	8	48	.166666667	Prob > F	=	0.0031
				R-squared	=	0.1684
				Adj R-squared	=	0.1511
Total	9.62	49	.196326531	Root MSE	=	.40825

Revenue_Impact_2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
frequency_of_loadshe~1	.6	.1924501	3.12	0.003	.2130532	.9869468
_cons	.6	.3701851	1.62	0.112	-.1443071	1.344307

```
. estat vif
```

Variable	VIF	1/VIF
frequency_~1	1.00	1.000000
Mean VIF	1.00	

```
. reg ( Operational_Capacity_Impact frequency_of_loadshedding_1 )
```

Source	SS	df	MS	Number of obs	=	49
Model	.179591837	1	.179591837	F(1, 47)	=	10.55
Residual	.8	47	.017021277	Prob > F	=	0.0021
				R-squared	=	0.1833
				Adj R-squared	=	0.1660
Total	.979591837	48	.020408163	Root MSE	=	.13047

Operational_Capacity~t	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
frequency_of_loadshe~1	.2	.0615719	3.25	0.002	.0761333	.3238667
_cons	1.6	.1183379	13.52	0.000	1.361935	1.838065

```
. estat vif
```

Variable	VIF	1/VIF
frequency_~1	1.00	1.000000
Mean VIF	1.00	

```
. reg ( Employment_Impact frequency_of_loadshedding_1 )
```

Source	SS	df	MS	Number of obs	=	50
Model	2.72222222	1	2.72222222	F(1, 48)	=	7.35
Residual	17.7777778	48	.37037037	Prob > F	=	0.0093
				R-squared	=	0.1328
				Adj R-squared	=	0.1147
Total	20.5	49	.418367347	Root MSE	=	.60858

Employment_Impact	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
frequency_of_loadshe~1	-.7777778	.2868877	-2.71	0.009	-1.354604	-.2009515
_cons	3.377778	.5518394	6.12	0.000	2.26823	4.487325

```
. estat vif
```

Variable	VIF	1/VIF
frequency_~1	1.00	1.000000
Mean VIF	1.00	