Journal Scientific of Mandalika (JSM)
https://www.ojs.cahayamandalika.com/index.php/jomla

Vol. 7, No. 5, 2026
e-ISSN: 2745-5955 | p-ISSN: 2809-0543
hh. 691-697

Analysis of household electricity expenditures among residents of suco leuro, lospalos administrative post, lautem municipality

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Abstract: *In general, the population of Suco Leuro relies on electrical energy for daily activities, which is predominantly non-renewable and supplied by the state through the public utility company EDTL (Eletricidade de Timor-Leste). This electricity is purchased via prepaid systems at designated sales stations; however, consumers often overlook strategies for energy conservation. Therefore, this study aims to examine the patterns of electricity expenditure among households in Suco Leuro over a one-week period. This research was conducted to describe both the positive and negative effects observed in the field. The study employed a sample-based research design, involving 60 household heads as respondents in Suco Leuro, Lospalos Administrative Post, Lautem Municipality, during the 2023 academic year. The findings indicate that 100% of the population in Suco Leuro has had access to electricity since 2013 and has installed prepaid electricity meters. The analysis of the results shows that 28.3% of households consume between 2.1 and 9.45 kWh per week, 45% consume between 10.14 and 18.4 kWh per week, and 26.7% consume between 22.45 and 43.86 kWh per week. These findings suggest that higher electricity consumption is primarily influenced by the duration of appliance usage and the power capacity of electrical devices used by households.*
Keywords: *Electrical energy, Population*

Abstrack: Secara umum, masyarakat di Suco Leuro bergantung pada energi listrik untuk kebutuhan sehari-hari, yang dikategorikan sebagai energi tidak terbarukan yang disuplai oleh negara melalui perusahaan publik EDTL (Eletricidade de Timor Leste). Energi listrik ini dibeli melalui sistem prabayar di stasiun penjualan yang telah ditentukan. Namun demikian, masih terdapat keterbatasan kesadaran di kalangan konsumen terkait praktik penghematan energi. Oleh karena itu, tujuan penelitian ini adalah untuk mengkaji pola konsumsi listrik rumah tangga selama periode satu minggu di Suco Leuro. Penelitian ini dilakukan untuk mendeskripsikan berbagai dampak, baik positif maupun negatif, yang muncul selama proses investigasi di lapangan. Penelitian ini menggunakan desain survei sampel dengan melibatkan 60 kepala keluarga sebagai responden di Suco Leuro, Posto Administrativo Lospalos, Município Lautem, pada tahun akademik 2023. Hasil penelitian menunjukkan bahwa 100% masyarakat di Suco Leuro telah memiliki akses terhadap jaringan listrik sejak tahun 2013 dan telah memasang meteran listrik prabayar. Analisis hasil penelitian menunjukkan bahwa sebesar 28,3% rumah tangga mengonsumsi listrik antara 2,1 hingga 9,45 kWh per minggu, sebanyak 45% mengonsumsi antara 10,14 hingga 18,4 kWh per minggu, dan 26,7% lainnya mengonsumsi antara 22,45 hingga 43,86 kWh per minggu. Temuan ini menunjukkan bahwa tingkat konsumsi listrik yang lebih tinggi dipengaruhi oleh durasi penggunaan peralatan listrik serta kapasitas daya dari perangkat listrik yang digunakan oleh rumah tangga.
Kata Kunci: Energi listrik, Masyarakat

How to Cite: Paulo Alves Cabral, Pedro Correia, Kristiani. (2026). Analysis of household electricity expenditures among residents of suco leuro, lospalos administrative post, lautem municipality. *Journal Scientific of Mandalika (JSM) E-ISSN 2745-5955 / P-ISSN 2809-0543, 7*(2), 265-275. https://doi.org/10.36312/10.36312/vol4iss1pp691-697

https://doi.org/10.36312/10.36312/vol4iss1pp691-697

INTRODUCTION

Prior to achieving independence as a sovereign nation, Timor-Leste experienced a series of historical challenges, including Portuguese colonization (1514–1974), Japanese occupation (1942–1945), and Indonesian invasion (1975–1999). Several years after the Indonesian occupation began, the administration was gradually established across the national territory. By 1976, the first formal schools were introduced, alongside continued development of basic infrastructure such as education, healthcare, bridges, roads, and other public facilities. In addition, the electricity sector inherited from the Portuguese colonial period was further maintained and expanded. However, at that time, many communities still relied on oil lamps, a practice that had persisted since the colonial era. Despite ongoing development in electricity, education, healthcare, and other sectors, it is evident that electricity remains a critical component for socio-economic development. Nevertheless, until 1999, electricity distribution was largely limited to urban populations.

Communities without access to electricity relied on traditional lighting methods. These locally made oil lamps varied in form and materials. In the eastern part of the island, most communities used coconut oil, Noz-da India, bamboo, and local candles as sources of lighting. Despite successive periods of occupation, these traditional lighting methods remained in use, particularly for nighttime activities and traditional ceremonies, where bamboo and coconut oil continued to play a central role.

During the Indonesian occupation, many communities also used kerosene-based lamps. However, due to limited economic capacity, a significant portion of the population could not afford kerosene regularly. As a result, many households continued to rely on Noz-da India lamps even after independence.

Electricity is widely recognized as a fundamental sector for national development, particularly in the era of globalization, where both public administration and private sector operations depend heavily on reliable energy supply. During the 24 years of occupation, infrastructure such as buildings, roads, bridges, water supply systems, and electricity networks were developed. However, electricity distribution remained uneven, with rural areas largely excluded, while only certain sucos located near urban centers gained access. According to the Electricity Sector Development Plan prepared by the Asian Development Bank (Asian Development Bank, 2004):

"The power system consisted of approximately 60 to 61 generation units, predominantly based on isolated diesel generators, primarily supplying electricity to urban areas. However, following the referendum, the events of September 1999 led to widespread destruction of nearly all sector assets, including generation plants, transmission infrastructure, and even household solar systems. Consequently, access to electricity remained very limited, with only about 28% of the population estimated to have access in 2001."

At the beginning of February, electricity distribution had reached all cities; however, disruptions were still reported in Maliana, Suai, Baucau, Same, Lospalos, and Liquiçá due to machine failures. In addition, by 1999, only about 25% of areas had access to electricity, and approximately 50% of the total population had access to electrical services (LKTT, 2000).

The electricity sector in Timor-Leste was severely damaged in 1999. Since then, successive governments and international organizations have made significant efforts to improve and expand electricity supply to consumers. EDTL (Eletricidade de Timor-Leste) serves as the national electricity provider under the supervision of the Ministry of Public Works (Pinto, 2020). However, financial sustainability remains a challenge due to non-payment of electricity bills. For instance, only about 40% of commercial customers in Dili pay their electricity bills, indicating that approximately 60% fail to meet their payment obligations (PEDN, 2011–2030).

Frequent discussions about power outages and reconnections in the capital and municipalities often overlook a key contributing factor: illegal or clandestine electricity connections in residential areas. These practices significantly contribute to increased electricity consumption and system inefficiencies in Timor-Leste. Moreover, frequent fire incidents are often attributed to electrical short circuits, which may result from improper or illegal connections. Such installations typically fail to comply with technical standards, particularly in terms of load capacity and circuit breaker (MCB/sekering) limits. Consequently, these conditions pose serious risks, including damage to household electronic devices.

If illegal connections occur within a household, neighborhood, or community, residents not only incur higher costs but also face significant risks of fire and other electrical hazards (de Lima, 2024).

Profile of Suco Leuro

During the Portuguese colonial period, administrative structures were established in Lautem and later expanded to sucos governed by traditional leaders (liurai), primarily for tax collection purposes. Suco Leuro was divided into four settlements (aldeias): Leuro, Tcharano, Waratcha, and Souro Moco, each consisting of smaller community units (Knua).

Despite population losses during the Indonesian occupation, current demographic data from the 2015 Population Census indicate that Suco Leuro has 837 residents, including 431 महिल (51.4%) and 406 men (48.6%). The number of households increased from 180 in 2010 to 210 in 2015.

In the post-independence period, the majority of residents in Suco Leuro continue to rely on agriculture, livestock, and local wine production as their primary sources of livelihood. These activities support daily living needs and enable families to finance their children's education. Approximately 15 years after independence, Suco Leuro gained access to electricity in November 2013. Meanwhile, the education sector began developing shortly after independence, albeit with limited resources. Access to healthcare services has been available since 2007. However, despite improvements in human development sectors, access to clean water remains a significant concern for the community, persisting from the occupation period to the present.

In terms of basic infrastructure development, 100% of the population in Suco Leuro has had access to electricity since 2013. Most households have installed prepaid electricity meters, although some—particularly economically disadvantaged households and elderly residents—have yet to do so. A major concern among residents is the absence of a local prepaid electricity sales station. Currently, residents must travel approximately 15 km to the municipal capital to purchase electricity credit. This unresolved issue may encourage illegal electricity connections.

Another major concern is the rapid depletion of prepaid electricity credit and the short lifespan of electronic devices. Based on these observed issues, the researcher aims to investigate the causes of rapid prepaid electricity consumption and frequent equipment damage.

To reduce electricity expenditure and prevent illegal connections, citizens are expected to cooperate with relevant authorities. Responsible and informed citizens should understand their roles in supporting the development of the electricity sector, particularly by reducing illegal usage. Additionally, protecting electronic devices requires awareness of appropriate energy consumption levels within households.

As a researcher, the study seeks to identify practical solutions to community concerns. This research aims to analyze the causes of high electricity expenditure and to disseminate findings to the community in order to promote safer and more efficient electricity usage, as well as to reduce electrical hazards such as short circuits and fires.

From an educational perspective, particularly as a future teacher, understanding the causes and impacts of illegal electricity use is essential. Teachers play a crucial role not only in delivering knowledge but also in shaping societal behavior by raising awareness among students regarding responsible electricity use at home.

This study is also grounded in the scientific field of physics, where electricity is understood as a natural phenomenon. Given its critical role in daily life, it is essential for educators to effectively teach students about energy consumption, safety standards, and proper usage of electrical appliances. Misuse of electrical devices that does not comply with technical standards may pose serious risks to human safety. Therefore, communities require accurate and relevant information to reduce electricity consumption, which this research seeks to provide.

Based on the above discussion, the fundamental reasons for conducting this study are:

- The rapid depletion of prepaid electricity credit among households;
- The limited durability of electronic devices used by the community.

Accordingly, the research addresses the following questions:

1. What is the level of electricity expenditure among households in Suco Leuro over one week?
2. What factors influence higher electricity consumption?
3. How can electricity usage be optimized for future efficiency?

In addition to the research problems, the study also aims to achieve the following objectives:

1.To determine weekly electricity expenditure among households in Suco Leuro;
2.To analyze household electricity consumption based on appliance power capacity and usage duration;
3.To assess prepaid electricity expenditure among households;
4.To identify challenges faced by the community related to prepaid electricity meter installation.

METHODS

In this study, the researcher employed a sampling approach. The sample was drawn to represent each aldeia within Suco Leuro. Suco Leuro consists of four (4) aldeias: Souro-Moco with more than 130 households, Leuro with 45 households, Luturula with 85 households, and Tcharano with 50 households. Accordingly, the total sample for this study comprised 60 households.

Data collection was conducted using observational techniques and brief interviews, allowing the researcher to obtain primary data directly from the field. In addition, a questionnaire-based approach was utilized to align the data collection process with the stated research objectives. To achieve these objectives, three (3) key observational parameters were applied:

1. The number of household electrical appliances used regularly;
2. The electrical power rating of these appliances;

The duration of appliance usage.

To facilitate more effective data collection, the researcher developed six (6) guiding questions. These questions were delivered in the Tétum language to ensure that respondents could clearly understand and accurately respond.

The collected data were analyzed using the standard formula for electrical energy consumption to determine expenditure levels. Specifically, the researcher recorded the power ratings of household electronic devices and the duration of their use. The formula applied is as follows:

$$E = \frac{P \cdot T}{1000}$$

Where:

E = energy consumption (kWh)
P = power of electronic devices (W)
T = time (hours)

Furthermore, the researcher employed a percentage formula to determine the proportion of households with higher electricity consumption levels in Suco Leuro:

$$P = \frac{f}{n} \times 100$$

Where:

P = percentage of appliance usage and electricity consumption
f = frequency of appliance usage and electricity consumption
n = total population or sample size

This methodological framework enables a systematic and measurable analysis of household electricity consumption patterns within the study area.

RESULT AND DISCUSSION

It is essential to identify the power ratings of the electrical appliances used regularly—or daily—by households, as well as the duration of their operation.

Table 1. Power Ratings of Electrical Appliances Used by Households

No	Electrical Appliance	Power (W)	% of Households Using
1	Lamps	10, 20, 30, 40	100%
2	Television	45, 65, 70, 75, 80	46%
3	Freezer	75	31.6%
4	Rice Cooker	400, 500, 700, 900, 1100	38.3%
5	Electric Kettle	1000, 1100, 1200, 1500	28.3%
6	Electric Stove	2000, 2200	23.3%

As previously noted, the power rating is a key factor in determining energy consumption. The following table summarizes the daily and weekly operating hours of the appliances:

Table 2. Operating Hours of Electrical Appliances per Day and per Week

No	Electrical Appliance	Hours of Use (h) Per Day	Per Week
1	Lamps	8, 9, 10, 12	–
2	Television	2, 3, 4, 5, 6, 8	–
3	Freezer	8, 12, 24	–
4	Rice Cooker	–	3.5, 6, 7
5	Electric Kettle	–	0.5, 2, 3, 3.5
6	Electric Stove	–	2, 3, 3.5, 4, 5, 6, 7

DISCUSSION OF RESEARCH RESULTS

To determine household electricity expenditure per day and per week, the standard energy consumption formula was applied:

$$E = \frac{P \times T}{1000}$$

Thus, to calculate the energy consumed, the researcher provides the following calculation example:

If a household uses five 10 W fluorescent lamps, each operating for 12 hours per day, the weekly energy consumption is calculated as follows. The result indicates that this household used 4.2 kWh of electricity over the course of one week.

The final results regarding the electricity consumption of households in Suco Leuro are presented in Table 3 below:

No.	E=P.T/1000 Lamps			E=P.T/1000 Television			E=P.T/1000 Freezer			E=P.T/1000 Rice Cooker			E=P.T/1000 Electric Kettle			E=P.T/1000 Electric Stove			E Total
	P	T	E	P	T	E	P	T	E	P	T	E	P	T	E	P	T	E	
1	50	12	4.2	80	3	1.68	75	12	6.3	1000	7	7			0	2200	5	11	30.18
2	50	10	3.5	65	4	1.82			0	1100	7	7.7	1100	0.5	0.55			0	13.57
3	160	12	13.44	75	2	1.05	75	12	6.3	900	7	6.3			0			0	27.09
4	60	12	5.04			0			0	400	7	2.8	1000	3.5	3.5			0	11.34
5	70	12	5.88	65	6	2.73			0	900	7	6.3	1100	2	2.2			0	17.11
6	30	10	2.1			0	75	12	6.3			0			0			0	8.4
7	60	10	4.2	75	6	3.15			0			0	1200	0.5	0.6			0	7.95
8	80	12	6.72	80	8	4.48			0			0			0			0	11.2
9	60	12	5.04			0			0			0			0			0	5.04
10	50	12	4.2	80	4	2.24	75	12	6.3			0			0			0	12.74
11	80	10	5.6	80	6	3.36	75	24	12.6	900	7	6.3	1200	0.5	0.6	2200	7	15.4	43.86
12	90	10	6.3			0			0			0			0			0	6.3
13	70	10	4.9	80	8	4.48			0			0			0			0	9.38
14	45	12	3.78			0	75	12	6.3	400	7	2.8	1200	0.5	0.6			0	13.48
15	60	12	5.04			0			0			0			0			0	5.04
16	60	10	4.2			0			0			0			0			0	4.2
17	65	10	4.55			0			0	700	7	4.9			0			0	9.45
18	60	12	5.04			0			0	900	7	6.3			0			0	11.34

19	200	10	14	80	3	1.68			0			0			0			0	15.68
20	60	10	4.2	75	8	4.2	75	8	4.2	900	3.5	3.15			0			0	15.75
21	30	10	2.1			0			0			0			0			0	2.1
22	200	10	14			0	75	12	6.3	500	7	3.5			0	2000	3	6	29.8
23	100	10	7	45	3	0.945			0	500	7	3.5			0	2200	5	11	22.445
24	135	12	11.34	80	6	3.36			0	500	7	3.5			0			0	18.2
25	170	12	14.28	80	5	2.8	75	12	6.3	900	7	6.3	1200	2	2.4	2200	3	6.6	38.68
26	105	10	7.35			0			0			0	1000	3	3			0	10.35
27	80	9	5.04			0			0			0			0			0	5.04
28	160	10	11.2			0	75	12	6.3	700	7	4.9			0	2200	3.5	7.7	30.1
29	145	10	10.15	80	3	1.68			0			0			0			0	11.83
30	160	10	11.2	75	3	1.575	75	24	12.6	700	7	4.9			0			0	30.275
31	150	10	10.5	80	2	1.12	75	24	12.6	1100	7	7.7			0	2200	33	72.6	104.52
32	170	10	11.9	75	4	2.1	75	24	12.6	1000	7	7	1000	0.5	0.5			0	34.1
33	160	12	13.44	75	8	4.2	75	24	12.6	900	7	6.3			0			0	36.54
34	80	12	6.72			0			0	500	7	3.5	1000	0.5	0.5			0	10.72
35	130	10	9.1	75	5	2.625			0	900	7	6.3			0			0	18.025
36	160	9	10.08	80	4	2.24			0			0			0			0	12.32
37	95	10	6.65	40	8	2.24			0	900	7	6.3			0	2200	5	11	26.19
38	144	8	8.064			0			0	700	6	4.2			0			0	12.264
39	155	12	13.02			0	75	24	12.6	1000	7	7	1000	0.5	0.5			0	33.12
40	40	10	2.8			0			0			0			0			0	2.8
41	144	8	8.064			0			0	500	7	3.5	1200	0.5	0.6			0	12.164
42	30	10	2.1			0			0	500	7	3.5			0	2000	4	8	13.6
43	100	12	8.4	70	4	1.96	75	24	12.6	1000	7	7	1200	0.5	0.6			0	30.56
44	70	12	5.88			0	75	12	6.3	700	6	4.2	1000	0.5	0.5			0	16.88
45	65	12	5.46			0	75	8	4.2			0	1200	0.5	0.6			0	10.26
46	184	10	12.88			0			0			0			0			0	12.88
47	80	10	5.6			0			0			0			0			0	5.6
48	90	12	7.56			0			0	500	6	3			0	2200	3	6.6	17.16
49	80	10	5.6	80	3	1.68	75	12	6.3	900	6	5.4	1200	0.5	0.6	2200	3	6.6	26.18
50	100	10	7	75	4	2.1			0	700	7	4.9			0	2200	2	4.4	18.4
51	30	12	2.52			0			0	1000	6	6			0			0	8.52
52	40	10	2.8	75	3	1.575			0			0			0			0	4.375
53	85	12	7.14			0			0	500	6	3			0			0	10.14
54	120	12	10.08	65	3	1.365			0	1100	6	6.6	1000	3	3	2000	7	14	35.045
55	80	12	6.72			0			0	1100	6	6.6			0	2200	6	13.2	26.52
56	55	12	4.62			0			0			0			0			0	4.62
57	70	12	5.88	75	5	2.625			0	500	7	3.5			0			0	12.005
58	80	10	5.6			0			0			0			0			0	5.6
59	100	12	8.4			0			0			0			0			0	8.4
60	144	10	10.08			0			0	500	6	3			0			0	13.08
			430.2			67.06			159.6			188.7			20.85			194.1	1060.508

For each unit or item in Table 3 above, the data show that lamps consume a minimum of 2.1 kWh and a maximum of 14.28 kWh per week. Meanwhile, televisions consume between 1.05 kWh and 4.48 kWh per week, freezers consume between 4.2 kWh and 12.6 kWh per week, rice cookers use between 2.8 kWh and 7.7 kWh per week, electric kettles consume between 0.5 kWh and 3.5 kWh per week, and electric stoves consume between 4.4 kWh and 15.4 kWh per week.

Based on the data presented in the same table for each unit, it can be observed that among the electrical appliances used daily by the households, lamps account for the highest energy consumption, totaling 430.2 kWh per week. Conversely, the appliance with the lowest energy consumption is the electric kettle, at 20.85 kWh per week.

Thus, this section illustrates the electricity consumption of the households over the course of a week. According to these consumption patterns, out of the 60 household heads surveyed, 16 households consumed between 22.445 and 43.86 kWh per week, 27 households consumed between 10.14 and 18.4 kWh per week, and 17 households consumed between 2.1 and 9.45 kWh per week.

CONCLUSION

Based on the findings of this research, it can be concluded that the electricity consumption of households in Suco Leuro varies significantly. From a sample of 60 household heads, 14 households consumed between 26.81 and 43.85 kWh per week, accounting for 23.3% of the sample, while 11 households consumed between 2.1 and 6.3 kWh per week, representing 18.3%. This variation highlights the differences in energy usage patterns among the population, influenced by household needs and appliance usage.

In terms of appliances, lamps, rice cookers, electric stoves, and freezers were identified as the primary contributors to weekly electricity consumption, with lamps alone consuming 430.2 kWh per week. Rice cookers and electric stoves followed with 188.7 kWh and 194.1 kWh, respectively, while freezers accounted for 159.6 kWh. On the other hand, electric kettles and televisions represented the lowest electricity consumption, using 20.85 kWh and 67.06 kWh per week, respectively. These results clearly indicate that daily energy consumption is strongly linked to the types of appliances used and their frequency of operation.

Furthermore, the analysis showed that the appliances consuming the most energy were lamps, whereas electric kettles were the least consuming. The study also revealed that higher energy consumption is mainly influenced by both the power ratings of the electrical appliances and the duration of their use each day. Interestingly, the results indicate that the operating time of appliances does not always correspond directly to their power ratings, suggesting that behavioral factors and usage patterns play a significant role in determining overall electricity consumption in Suco Leuro households.

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