

KEY FACTORS TO CONSIDER WHEN DESIGNING PRODUCTS TO OVERCOME THE PERSISTENCE OF UNSAFE KEROSENE LAMPS AMONG LOW-INCOME HOUSEHOLDS IN SRI LANKA

MANAWASINGHE M.D.R.N.^{1*}, RANASINGHE W.M.N.D.² & DISSANAYAKE M.K.³

^{1,2,3}University of Moratuwa, Sri Lanka

¹ravindunish.99@gmail.com, ²dilshanir@uom.lk, ³meldisan@gmail.com

Abstract: Even with advancements in alternative lighting technologies, a notable proportion of impoverished communities still use unsafe kerosene lamps for illumination. It exposes them to a myriad of dangers, including injuries, deaths, and accidents. the use of kerosene lamps is continued although developments in alternate lighting technology put human health and safety in danger. This research investigates the reasons behind the continued reliance on kerosene lamps among the residents of Waverley Estate Line Houses in Agarapathana, Sri Lanka. The study aims to discern and analyse the socio-economic, cultural, and infrastructural factors contributing to the persistence of this perilous lighting practice. this study uses a mixed-method technique that combines focus group discussions with self-observation to gather qualitative data. The main obstacles identified are extreme poverty, large upfront expenses for legal electrical connections, ignorance about how to maintain alternate lighting options and cultural familiarity with kerosene lamps. Notably, fire risks are increased when flammable materials are used in domestic environments. The study highlights the need for multidisciplinary interventions, identifying key design considerations such as easy maintain and repair, community training initiatives, subsidised electricity connections, , and the development of affordable, safe lighting fixtures. It is also suggested that it is crucial to have long-term plans for raising living standards through economic development programs. These observations are intended to assist practitioners and policymakers in developing practical, long-lasting solutions that would lessen the risks of using kerosene lamps and enhance the well-being of these marginalised groups.

Keywords.: *Kerosene lamps, Low-income households, Fire hazards, Design Considerations, Product Design*

1. Introduction

Electricity has been identified as one of the basic needs in today's world, which is essential for everyday living and community growth. This research attempts to unveil the socio-economic and cultural nuances influencing energy choices in low-income households through a comprehensive survey and qualitative interviews. It further delves into the tangible hazards associated with the use of kerosene lamps. The study focuses on a community of plantation workers living in line houses at Waverley Estate in Agarapatana, Hatton, Nuwara Eliya, in the Central Province of Sri Lanka. According to observations many of these workers are among the poorest in the area, they cannot afford the high cost of power. As a result, several homes turn to dangerous homemade kerosene lamps for lighting. By identifying injuries, deaths, and accidents resulting from the use of these lamps, the study underscores the urgent need to address the immediate dangers posed to individuals within these vulnerable communities. The findings of the study provide a nuanced understanding of the complexities surrounding energy choices, shedding light on the multifaceted challenges faced by Line Houses. Moreover, this research offers valuable insights for policymakers and practitioners striving to implement effective strategies for the adoption of safer and environmentally friendly lighting solutions in similar low-income contexts. Further, this study not only contributes to the academic understanding of energy choices but also underscores the need for well-designed solutions that safeguard the lives and well-being of the people in impoverished communities.

1.1 RESEARCH PROBLEM

Low-income households in Sri Lanka keep using dangerous kerosene lamps, which underlines the urgent need to find design factors that might solve this enduring problem. Designing successful treatments requires an understanding of the reasons behind these households' continued reliance on paraffin lamps even though their recognised risks. To understand why this preference exists, it is necessary to investigate elements like cultural, societal, and economic impacts. The adoption of safer and more environmentally friendly alternatives is further hampered by some difficulties and constraints, such as the high upfront costs of alternative lighting choices, a lack of knowledge, and problems with accessibility and dependability. Understanding how carefully designed interventions may address the socioeconomic issues maintaining this dependency and provide workable, reasonably priced, and community-centered solutions that cater to the particular requirements of these households is essential to overcoming these challenges. By taking these factors into account, the study aims to offer practical advice on lowering reliance on paraffin lights and encouraging safer substitutes.

*Corresponding author: Tel: +94770407290 Email Address: ravindunish.99@gmail.com

DOI: <https://doi.org/10.31705/FARU.2024.24>



Figure 1, Location on map (Source: Google maps)

2. Literature Review

2.1 INTRODUCTION

A review of the literature is the first step towards understanding the main problems and larger background of low-income households' reliance on paraffin lamps. The dependence on kerosene lamps by low-income households in areas like Waverley Estate Line Houses presents a pressing concern, further compounded by the severe health and safety hazards associated with these outdated lighting sources. The literature review summarizes previous research to shed light on the socioeconomic, cultural, and infrastructure challenges that sustain the usage of dangerous lighting solutions. This review investigates the health and safety hazards of paraffin lamps and the barriers to switching to alternate lighting alternatives. In addition to pointing out knowledge gaps that this study attempts to fill, this review attempts to offer an in-depth understanding of the issue.

2.2 HEALTH AND SAFETY HAZARDS OF KEROSENE LAMPS

Despite the availability of alternative lighting solutions, it is crucial to recognize the serious consequences linked to the continued use of kerosene lamps. Individuals who lack access to cost-effective and dependable energy sources for daily requirements such as cooking, lighting, and heating often resort to using inefficient fuels and technologies, which contribute to air pollution within households (Curto and Ariadna, 2020). Moreover, the open flame characteristic of kerosene lamps poses a significant fire hazard, resulting in numerous injuries, fatalities, and property damage incidents, particularly in poorly ventilated and densely populated dwellings (Jayasinghearachchi, et al., 2020). Given these dangers, it is essential to understand why communities continue to rely on kerosene lamps in order to develop effective interventions that can mitigate the adverse health and safety impacts associated with their use.

2.3 GLOBAL AND LOCAL STATISTICS ON ENERGY ACCESS

According to the World Health Organization, nearly one billion individuals globally suffer from a lack of power, owing to social, economic, and cultural issues (Osseiran & Safar, 2023). A recent study emphasized that over 759 million people globally lack access to electricity, with more than 90% of them located in low-income countries in the global south (Correa, et al., 2022). Even with high-voltage power lines passing through a village providing the main power can occasionally be difficult due to technological and economic difficulties, resource constraints, social and cultural considerations, and environmental issues.

Kerosene lamps are used by about 1.2 billion people globally for illumination purposes. However, there are potential hazards associated with their use, including burns and fire due to accidents such as malfunctioning devices or improper handling (Lenz, et al., 2018). The study demonstrates how the flammable nature of kerosene and inappropriate appliance use can result in risks like fires, explosions, poisonings, and thermal injuries.

2.4 IMPACT OF KEROSENE LAMP USE IN SRI LANKA

According to research on burns in Sri Lanka, kerosene is the cause of 15.2% of burn injuries (Jayasinghearachchi, et al., 2020). In Colombo's National Hospital, 31% of 487 patients aged 12 and above were admitted for accidental burns caused

by homemade kerosene lamps. At Batticaloa General Hospital in the Eastern Province, 41% of burns were unintentional and resulted from kerosene lamps. These infections frequently worsen the injuries, which may lead to disability and psychosocial trauma (Mills, 2012). In another study on burn injuries in Sri Lanka, married women under 40 made up the bulk of the victims, while using traditional lamps (Pirasath, et al., 2013). According to the Evans Mills report, Sri Lanka was named one of the developing countries with the highest rates of kerosene burns and ingestion (Mills, 2012). Furthermore, children in rural parts of underdeveloped nations like Sri Lanka are frequently affected by kerosene oil poisoning (Dayasiri, et al., 2017). A physician, Dr. Godakumbura who has dedicated his life to creating better lamps and educating people about fire safety, claims that kerosene lamps cause 40% of burns in Sri Lankan homes and that the government of Sri Lanka contributes over one million dollars every year for treating burn injuries (Shepherd & Perez, 2007). These studies demonstrate the risk associated with these dangerous kerosene lamps.

As per the Asian Development Bank, Sri Lanka achieved island-wide coverage of 100% for power delivery in 2016 (Asian Development Bank, 2023). The most recent data available indicates that 98% of Sri Lanka's land is already connected to the grid the rest of it is electrified using a variety of off-grid electrification techniques, mostly solar household systems and micro-hydro-based mini-grids (Sarangi, et al., 2019). Although the use of kerosene lamps has declined, it is still possible to observe some individuals in Sri Lanka relying on them for lighting purposes.

2.5 POVERTY AND ECONOMIC FACTORS.

Since Sri Lanka is a developing country the poverty percentage is high, according to the study, Nuwara Eliya is the highest poverty percentage in Sri Lanka, more than 30% of people in Nuwara Eliya are multi-dimensionally poor, indicating a significant level of poverty in this district (Silva & Premaratna, 2023). Further, Nuwara Eliya is home to the majority of tea plantation workers. Workers on tea plantations fall into the category of wage-earning labours. The daily salary is made up of basic pay as well as various allowances that have been changed over time, although the total has always been less than what workers in rural and urban areas of the country receive. Ironically, the country's low-income groups are those who work in estates (Chandrabose, 2015).

Although knowing that Sri Lanka's economy is largely dependent on the tea sector, workers on tea plantations are frequently exploited. Since 1998, plantation workers have been paid a daily wage rate for their labour as stated by a wage collective agreement signed once every two years by the Plantation Trade Unions, who represent the tea estate workers, and the Ceylon Employers Federation, which represents the plantation management companies (Vijesandiran, 2021). Which is a very precarious and unstable form of generating income. In addition, they are not able to benefit from bonuses, house ownership and other advantages (Azmi, 2022). Employees must pick a certain number of tea leaves each day in order to be paid their wages. Until 2021 a plantation worker had to collect at least forty pounds of tea leaves in order to receive their daily wage of 700 Sri Lankan rupees (LKR), or roughly \$2.50. Further, "Tea plantation trade unions" have been calling for an increase in the daily salary of 1,000 LKR since about 2016. January 2021 was the last payoff for the protests. The Wages Board Regulations were changed by the Cabinet of Ministers, bringing about a minimum 1,000 LKR daily wage rise for tea workers. The majority of tea workers still find it difficult to make ends meet despite this pay boost. Moreover, since "no work means no pay," employees are unable to take time off due to lack of sick leave (Lakhiani, 2021).

The above studies demonstrate how impoverished plantation workers. Ceylon Electricity Board claims that the cost of using the service for the first time is approximately \$40,000. Additionally, among South Asian nations, Sri Lanka has the highest consumer electricity tariff rates (Wijayapala & Kankanamge, 2016). Thus, how could plantation laborers, who make roughly 1000 rupees a day, afford electricity? Because of this, even though they are aware of the risks involved, some of them still rely on kerosene lamps.

2.6 HOUSING CONDITIONS IN LINE HOUSES



Figure 2, Housing Conditions of line houses (Source: Sri Lanka Brief)

Approximately 80% of Tamil Indians work on tea plantations, the majority of them are employed by the estates and live in the state area. In Sri Lanka, the rows of rooms where they are kept are commonly referred to as line houses (Chandrabose, 2015). "Line rooms" have the physical characteristics of barrack-style buildings with constrained space that limited natural light, ventilation, and privacy. Ten to fifteen residential units are arranged in a straight line next to one another. Bricks or stones were used for the walls, while aluminium sheets were used for the roof (Perera & Coorey, 2017). Meaning that if a fire breaks out, it can spread quickly. The situation of estate housing in general, especially line rooms, is perceived as a contributing factor to poverty at the community level (Gunetilleke, et al., 2008). This is reasonable as the line rooms were designed for single people, not families. Sometimes expansions are carried out with the least amount of room, money, materials, and expertise, as a result, vital elements like light, ventilation, and privacy are lost (Perera & Coorey, 2017). According to recent research, those who live in estate sectors typically have poorer housing options and are more at risk for health hazards due to unhygienic surroundings. There is less accessibility to power and private toilets as well as clean drinking water (Fukuda & Yamaji, 2017).

2.7 RESEARCH GAP

The literature review mentioned above emphasises the serious fire hazards and safety concerns that come with using kerosene lamps. Due to socioeconomic, cultural, and infrastructure hurdles, many low-income households—especially those in neighbourhoods like Waverley Estate Line Houses—continue to use kerosene lamps even in the face of improved access to electricity and alternative lighting options. However, there is a clear lack of contemporary research that focuses on the continued use of kerosene lamps in low-income Sri Lankan families. Based on the observations this study aims to identify the specific challenges and barriers that prevent the adoption of alternative lighting solutions and explore how targeted interventions can effectively address those factors influencing these communities' reliance on kerosene lamps by understanding key design considerations. The study will close this research gap and offer practitioners and policymakers valuable information that will help them create strategies to improve the safety and well-being of those who are most at risk.

3. Methodology

3.1 DATA COLLECTION METHOD

Waverly Estate in Agarapatahana was selected as a case study for several important reasons. A considerable number of homes in this estate do not have access to power, indicating a substantial gap in the availability of energy. Furthermore, a significant number of low-income households live in the estate, which makes it a relevant case study to investigate the continued use of kerosene lamps. In addition, there have been recorded fire incidents in the region, highlighting the critical need to address the safety risks related to the usage of kerosene lamps.

A mixed-method approach is used in this study to combine quantitative (minimal) and qualitative research techniques, including grounded theory and open-ended interviews, to provide a thorough knowledge of the continued use of kerosene lamps in Waverley Estate Line Houses. This methodology facilitates an in-depth investigation of the statistical frequency as well as the complex socioeconomic and cultural factors affecting this behaviour.

The sample size selected for the study was forty-eight families. According to information gathered from the Development Officer of the area, there are forty eight homes without electricity in the estate. A structured questionnaire was conducted for all forty eight households. The questionnaire was aimed to gather comprehensive data on various aspects, including reasons for not having electricity, alternative lighting devices, usage patterns, income levels, continued use of kerosene lamps, and social background. The households that were still utilizing kerosene lamps for lighting were identified after the initial questionnaire. A representative sample of these homes was chosen and performed in-depth qualitative interviews with them to ensure a varied mix of gender, age, and socioeconomic levels. The purpose of the interviews was to go further into reasons for the continued use of kerosene lamps, income and financial constraints, family and social status, and cultural factors. Focus group discussions were conducted with family members from non-electrified households, community leaders and local government officials working in the area. Understanding the larger socioeconomic and cultural background as well as potential answers to community-wide problems was aided by these discussions. To evaluate the living conditions, physical features, and overall surroundings of the Waverley Estate Line Houses, direct observations were also carried out. Contextualizing the survey and interview data was made clearer through these.

3.2 LIMITATIONS

The primary language spoken by residents of Waverley Estate is Tamil, so using a translator during interviews may have affected the accuracy and depth of responses. Other limitations of this study include the use of a relatively small sample size of 48 households, which may limit the generalisability of the findings and the difficulty in gathering information about the ongoing use of kerosene lamps in this particular context due to participants' lack of literacy. Further restriction was using self-reported data, which is subject to the participants' honesty and recall accuracy. The study also encountered challenges because of limitations related to cultural and other factors, as well as a lack of reliable data. Finally, language fluency issues, both in understanding the local dialects and translating responses accurately, added an additional layer of complexity to the research.

4. Analysis and Results

4.1. ENERGY ACCESSIBILITY AND USAGE TRENDS

Based on the data provided by the Development Officer, forty eight homes in Waverley Estate do not have a formal electrical connection. According to the questionnaire answers, twenty five of these households—or 52% of the total—are illegally sharing electricity through unplanned wiring arrangements with other homes. In addition to breaking Sri Lankan laws, this technique presents serious safety issues and might be partly to blame for the recent fire incidents among line houses caused by electrical leaks. The primary reason behind this unsafe practice is the inability of these households to afford the initial payment required for a legal electricity connection. All the residents in these households are plantation workers, whose daily wages are insufficient to cover their daily necessities, let alone the additional cost of securing a proper electricity connection. Many of these homes use some electrical appliances including radios, electric torches, electric irons, and cell phones even though they do not have formal access to power. Of the twenty five houses sharing power, it was found that eleven of them also had kerosene lamps. This dual dependency draws the precariousness of their energy situation and the persistent reliance on kerosene lamps despite having access to some electricity.

Eleven of the forty eight homes, according to the study, utilise rechargeable lights rather than getting electricity illegally. These households use their neighbours' houses to recharge their rechargeable lights. They are paying them a certain amount towards their electricity bill. It is interesting to note that, despite the availability of alternate lighting options, nine out of the eleven homes still use paraffin lamps, highlighting the pervasive reliance on these lamps.

Twelve of the homes relied only on kerosene lamps for lighting, and due to a variety of issues, the majority of these homes employed just one person in addition to other homes, contributing to their impoverished income. After discovering that they only utilised kerosene lamps, in-depth interviews were conducted with them.

Table1: Distribution of lighting sources among households according to survey analysis (Source: Author creation)

Light Source	Illegally Sharing Electricity and Kerosene lamps	Rechargeable Lighting Devices and Kerosene lamps	Only Kerosene Lamps	Alternative Lighting Devices
Number of Houses	25	11	12	0

4.2 SOCIAL AND ECONOMIC BARRIERS TO OBTAINING ELECTRICITY

It was identified that the significant upfront costs associated with obtaining a legitimate power connection are the main cause of not having energy. The majority of these plantation laborers receive daily pay between 600 to 1,000 rupees, and since they are not employed every day of the month, they only get paid for the days that they are employed. Furthermore, they have no savings because their daily income is used to pay for their immediate needs. As such, they are unable to purchase electricity or other battery-operated lamps. The development officer claims that there is an opportunity for people with Samurdhi allowances—which fall into two categories, "Extremely Poor" and "Poor"—to receive power in three instalments. However, it was discovered through in-depth interviews that the amount of one instalment can be obtained for a higher price, which these workers are unable to pay for.

The majority of the adults living in these families do not possess a high enough education level to be considered O/L (Ordinary Level). Data gathered from the Development Officer confirmed this. Additionally, the school children in these households face a serious issue with their inability to study well due to the lack of power.

4.3 CHALLENGES USING ALTERNATIVE LIGHTING SOLUTIONS



Figure 3, Study area. (Source: Author Creation)

Due to the short lifespan of alternative items, they have used, as the study observed, there were no households using alternatives like solar lamps. Some houses had solar lamps that were given to them by different parties, although they were frequently broken. The locals had no suitable location to service the solar lamps and lacked the skills and materials necessary to fix them. They were also unable to pay for the price of repairs or new parts. So these people are returning to their familiar homemade kerosene lamps when the safer lighting options, break.

Based on the observations, identified that although they own kerosene lanterns, which are safer than the homemade lamps they use, they do not use them for a variety of reasons. The wicks for these kerosene lanterns are to be purchased from the market, and they consume a lot more kerosene than domestic lamps. They continue to utilize the homemade kerosene lights for these reasons. The causes are extreme poverty, a lack of technology resources, and a lack of education.

4.4 SAFETY RISKS OF HOMEMADE KEROSENE LAMPS

The people usually used 180ml arrack bottles for their homemade kerosene lamps. These bottles were the easiest to obtain and were the ideal size for lights. However, there were serious risks associated with the way these bottles were made. The bottles are quite unstable and prone to toppling over because of their thin bottom and height. They can easily spread a fire because they are made of glass, which makes them prone to breaking when they fall. Furthermore, it was found that the lids on these bottle lamps are frequently missing, which raises the possibility of kerosene leaking at any time. These lamps provide a serious fire risk due to their exposed flame, which increases the risk. The risk of using them is greatly increased by their instability and the possibility of devastating fires.



Figure 4, Homemade kerosene lamps (Source: Author creation)

All these line houses, where people reside, are made of extremely flammable materials. Under the roof, ceilings made of wood or polythene are frequently utilised, which can help a fire spread quickly in the event of a fire. This considerably raises the possibility of fire dangers in these crowded, poorly constructed homes.



Figure 5, Waverley estate line houses (Source: Author creation)

4.5 PERSISTENT USE OF KEROSENE LAMPS

Many residents still use handmade paraffin lamps in spite of past fire tragic events. Extreme poverty, the ease of making these lamps themselves, the accessibility of materials from their surroundings, the cheap prices involved, the simplicity of maintenance, and their familiarity with the technique are the main causes of this persistence. Using alternative lighting systems is hampered by unpredictable pricing, an absence of repair facilities, insufficient resources and experience, difficult maintenance, and the difficulty of really poor people to afford batteries.

5. Conclusion

The issue of people of Waverley Estate Line Houses in Agarapathana, Sri Lanka continuing to use unsafe kerosene lamps is complex and influenced by many factors, including cultural, socioeconomic, and infrastructure-related aspects. The main reasons behind the continuous use of kerosene lamps, the particular difficulties and barriers preventing the adoption of safer lighting solutions, and possible approaches for successful interventions have all been determined by this research. Moreover, the community does not have the necessary social infrastructure in place to address some of these problems. Residents are not able to maintain alternate lighting sources, such as solar lamps, because there are no nearby repair centres or training programs. Because there is a lack of support system, even if people choose safer lighting choices, they might not have the tools or knowledge to maintain them up to currently, leading them to revert to familiar, unsafe kerosene lamps.

Cultural familiarity and tradition also play a role. The people in the community have been using handmade kerosene lamps for a very long time. These lamps are simple to make using readily available materials and require minimal maintenance, which makes them an appealing option despite the associated risks. Because they lack the money and knowledge to maintain and repair alternate lighting choices, people frequently turn back to kerosene lamps. The unstable and hazardous nature of the homemade kerosene lamps and flammable material used to construct the line homes both contribute to the heightened risk of a fire. Changing these deeply rooted habits requires not just financial investment but also cultural education and awareness campaigns to shift community norms toward safer practices.

A multidisciplinary strategy is required to solve the lighting problems facing low-income communities, such as those at Waverley Estate Line Houses. The extremely impoverished may find it easier to gain legal power with the help of subsidised electrical connections. The implementation of community training programmes, local repair centres, and education and training on maintaining and use of alternative lighting options, such as solar lamps, can enable locals to make good use of these safer choices. The immediate fire hazards associated with homemade kerosene lamps can be reduced by designing stable and safe kerosene lamps or long-lasting rechargeable lights with long-lasting batteries. Programmes to raise community understanding about the risks associated with kerosene lamps and the advantages of alternate lighting sources can change cultural norms and encourage safer behaviour. Long-term economic upliftment efforts like job opportunities, skill development, and equitable wage policies are required to enhance general living standards and lessen reliance on risky lighting habits. The identification and resolution of barriers such as financial limitations, lack of maintenance knowledge, cultural customs, immediate safety issues, and economic challenges are critical for constructing alternate lighting solutions for these people. Inventors should make sure to focus on factors such as safety, affordability, ease of maintenance, cultural sensitivity, and the potential to promote economic empowerment when designing the products by applying a human-centered design approach. This involves developing a solid empathy for the requirements of the community, identifying particular issues, coming up with a variety of creative solutions, prototyping and testing in actual settings, and iterating in response to feedback. Inventors, Designers and Engineers can innovate creative, eco-friendly, vernacular and community-specific lighting solutions that improve safety and quality of life by applying defined key factors.

6. References

- Azmi, F., 2022. *MIDEQ*. [Online]
Available at: <https://www.mideq.org/en/blog/in-search-of-greener-pastures-unsafe-migration-in-sri-lankas-tea-plantation-sector/>
- Chandrabose, A., 2015. OUTGOING LABOUR AND ITS IMPACT ON THE TEA PLANTATION SECTOR IN SRI LANKA. *5th International Symposium, SEUSL*.
- Correa, S. et al., 2022. PowerScour: tracking electrified settlements using satellite data. *BuildSys '22*.
- Curto and Ariadna, 2020. Kerosene-based lighting: an overlooked source of exposure to household air pollution?. *CLEAN AIR JOURNAL*.
- Dayasiri, M. B. K. C., Jayamanne, S. F. & Jayasinghe, C. Y., 2017. Risk Factors for Acute Unintentional Poisoning among Children Aged 1-5 Years in the Rural Community of Sri Lanka. *Hindawi*.
- Fukuda, Y. & Yamaji, E., 2017. A Comparative Study of Housing Conditions among living Sectors in Sri Lanka and among Residential Areas in Tea Industry, Matara District, Southern Part of Sri Lanka. *International Journal of Environmental and Rural Development*.
- Gunetilleke, N., Kuruppu, S. & Goonasekera, S., 2008. *Tensions and Changes in the Tea and Rubber Plantations in Sri Lanka*, s.l.: CENTRE FOR POVERTY ANALYSIS (CEPA), COLOMBO.
- Osseiran, N. & Safar, P., 2023. *World Health Organization*. [Online]
Available at: <https://www.who.int/news/item/14-01-2023-close-to-one-billion-people-globally-are-served-by-health-care-facilities-with-no-electricity-access-or-with-unreliable-electricity>
- Jayasinghearachchi, T., Kiriwaththuduwa, S. & Sirisena, P., 2020. Burns in Sri Lanka: Analysis of pattern of burn and initial management steps of patients admitted with burns to Teaching Hospital Kandy. *The Sri Lanka Journal of Surgery*.
- Lakhiani, K., 2021. *THE EXPLOITATION OF TEA PLANTATION WORKERS IN SRI LANKA*. [Online]
Available at: <https://borgenproject.org/tea-plantation-workers-in-sri-lanka/>
- Lenz, L., Montenbruck, L. & Sievert, M., 2018. Accidents caused by kerosene lamps—New evidence from African household data. *Wiley Interdisciplinary Reviews: Energy and Environment*.
- Mills, E., 2012. *Health Impacts of Fuel-based Lighting*, Dakar: 3rd International Off-Grid Lighting Conference.
- Perera, Y. M. & Coorey, S. B. A., 2017. HOUSING CHARACTERISTICS AND LIVEABILITY OF 'LINE HOUSES' IN RAKWANA. *FARU*.
- Pirasath, P., Jeepara, P. & Velappody, J., 2013. Burn injuries in the Eastern Province of Sri Lanka: an analysis and outcome in a tertiary care hospital, Batticaloa. *Sri Lanka Journal of Surgery*.

- Sarangi, G. k. et al., 2019. Marginalisation of of-grid energy sector in Sri Lanka: What lessons could be learnt?. *Environment, Development and Sustainability-Springer*.
- Shepherd , J. E. & Perez , F. A., 2007. Kerosene lamps and cookstoves—The hazards of gasoline contamination. *Fire Safety Journal*.
- Silva, H. V. S. d. & Premaratna, S. P., 2023. AN APPROACH TO DETERMINE MULTI-DIMENSIONAL POVERTY INDEX FOR SRI LANKA: A COMPARATIVE STUDY. *Sri Lankan Journal of Banking and Finance*.
- Vijesandiran, S., 2021. *Study on Living Wage for the Sri Lankan Tea Estate Workers*, s.l.: Institute of Social Development (ISD).
- Wijayapala, W. D. A. S. & Kankanamge, T. N., 2016. Assessment of the Impacts of Electricity Subsidies in Sri Lanka. *ENGINEER*.