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MERITS AND DEMERITS OF OFF-GRID SOLAR SYSTEMS: KEY STAKEHOLDERS' PERSPECTIVES

D.S.A. Ranasinghe[1], K.G.A.S. Waidyasekara[2] and D. Weerasooriya[3]

ABSTRACT

In today's world, energy and human life are inextricably linked. Due to the scarcity of fossil fuels and rising prices, the world is shifting to renewable energy sources to acquire energy. The economic downturn and the government's inability to import fuel have exacerbated the energy crisis in the Sri Lankan context. Every day, prolonged power outages become a part of people's lives, which drives people to find alternative solutions. Even though solar PV systems are a popular renewable energy source in Sri Lanka, having an on-grid solar system has no advantages during power outages. Thus, Sri Lanka has an apparent demand for off-grid solar systems. Therefore, this study investigates the merits and demerits of utilising off-grid solar systems from key stakeholders' perspectives. Three key stakeholders were identified: government authorities, off-grid solar service provider companies and off-grid solar users. Twenty-five semi-structured interviews with key stakeholders were conducted after a thorough literature review. The collected interview data were analysed manually using content analysis. The study's findings revealed the significant merits of using off-grid solar systems in the Sri Lankan context as; the benefit of an uninterrupted power supply and reducing the national grid demand. The study revealed significant demerits: unavailability of proper regulations, capital-intensive investment, no return on investment and the lack of qualified people in the off-grid solar sector. The respective industry practitioners and stakeholders can use the knowledge gained from this study to promote and utilise future policy implications in the off-grid solar sector.

Keywords: *Energy Crisis; Government Authorities; Off-Grid Solar Service Provider Companies (OGCs); Off-Grid Solar Systems; Off-Grid Solar Users.*

1. INTRODUCTION

Energy is a critical commodity and a natural resource, without which human existence is highly doubtful (Anandan et al., 2022). Human urbanisation and industrialisation have relied heavily on the increasing consumption of non-renewable energy sources over the last three decades (Islam et al., 2022). However, the world's reliance on non-renewable resources has created significant global issues and challenges, such as future non-renewable fuel shortages, electric utility stability, and environmental impacts (Rehman et

[1] Undergraduate, Department of Building Economics, University of Moratuwa, Sri Lanka, diyanaranasinghe@gmail.com
[2] Senior Lecturer, Department of Building Economics, University of Moratuwa, Sri Lanka, anuradha@uom.lk
[3] Junior Lecturer, Department of Building Economics, University of Moratuwa, Sri Lanka, dilanw@uom.lk

al., 2022). Patel et al. (2022) stated that the energy crisis and climatic change justify using Renewable Energy Sources (RESs) utilisation and improvement. Solar, wind, biomass, hydropower, geothermal, and tidal energy are commonly available RESs for meeting energy demand (Abubakr et al., 2022; Yong et al., 2023). Solar energy is the most plentiful natural resource that can be converted into electrical and thermal energy by altering sunlight (Ashraf et al., 2023). Meliala et al. (2021) pointed out that derived solar energy is widely applied to residential electrification as off-grid, on-grid, or hybrid systems. Installing an off-grid Photovoltaic (PV) system is a systemic approach to capturing solar energy (Akinsipe et al., 2021). Off-grid power systems are non-grid power systems that operate independently and are classified as decentralised and distributed (Mugisha et al., 2021). Qaiser (2022) reported that South Asian governments face challenges such as high dependency on fossil fuels, the increasing gap between demand and supply of fossil fuels, and the advancing import prices due to the increase in global prices.

In Sri Lanka, electricity is generated primarily from three sources: hydropower, thermal power (coal and fuel oil), and other non-conventional RESs such as wind and solar power (International trade administration, 2022). As a small island, Sri Lanka has the viability to develop renewable energy systems because it has abundant sunlight during the year along with wind resources (Kolhe et al., 2014). However, Sri Lanka is experiencing its worst economic crisis since 1948, with imports stalling, running low on fuel and medicine, and rolling power outages (Jayasinghe, 2022). Perera (2023) pointed out that the focus on fuel and electricity has shifted towards RESs due to the massive energy demand crisis Sri Lanka is currently experiencing. Therefore, this study aims to investigate the merits and demerits of Off-Grid Solar (OGS) systems as a solution to the energy crisis in Sri Lanka.

There is a growing trend of research on OGS in many areas, such as challenges, feasibility studies, and benefits worldwide, especially in the Global South (Patel et al., 2022; Groenewoudt & Romijn, 2022; Kundu & Ramdas, 2022). Though there are many studies on on-grid and hybrid solar systems, it is rare to find studies focused on OGS systems in Sri Lankan context. However, Sovacool (2015) discussed OGS systems when expanding rural access to renewable energy from Sri Lanka's Energy Services Delivery Project (ESDP). Kolhe et al. (2014) have conducted a techno-economic analysis of off-grid hybrid renewable energy systems for Sri Lanka. In particular, to the author's knowledge, comprehensive studies on the merits and demerits of OGS systems from the key stakeholders' perspectives have not been conducted. Thus, the current study aims to investigate the merits and demerits of utilising off-grid solar systems from the key stakeholders' perspective.

The paper is structured as follows. Section 2 describes the initial literature findings to identify the merits and demerits of using OGS systems. The methodology of the study is presented in Section 3. Section 4 describes the data gathered through semi-structured interviews with data analysis. Section 5 discusses the research findings from the data analysis for the Sri Lankan context. The conclusion summarises the study, makes recommendations and points out future research directions for key stakeholders and industry practitioners.

2. LITERATURE REVIEW

2.1 OFF-GRID SOLAR PV SYSTEMS

Photovoltaic (PV) systems are commonly used in grid-connected and standalone operation modes (Koko, 2022). A review by Mishra et al. (2023) revealed that most of the research on renewable systems for power supply has focused on standalone systems for isolated locations. Karthikeyan et al. (2017) highlighted that an OGS PV system is not connected to the power grid, eliminating power quality issues and electricity billing. Aklin et al. (2017) claimed that OGS technologies are an affordable and clean solution to satisfy basic electricity needs. Moreover, OGS technologies have the potential to meet the twin goals of universal energy access and low-carbon technology diffusion (Singh, 2016, 2017). Global Off-Grid Lighting Association (GOGLA, 2018) demonstrated that even in countries where the government aims to provide grid-based solutions to the large majority, off-grid solutions can still help stimulate electrification.

2.2 MERITS OF USING OFF-GRID SOLAR SYSTEMS

Gill-Wiehl et al. (2022) discovered that OGS systems benefit not always monetarily. Off-grid renewable energy options are a practical electrification option that can be quickly scaled up, environmentally friendly, adaptive to local conditions, and, most significantly, empower rural communities, especially women and young people (International Renewable Energy Agency [IRENA], 2019). Because, Solar Home Systems (SHSs) are standalone, the advantages of usage variety cannot be realised (Nasir et al., 2019). Due to the presence of solar power, OGS rural applications are very appealing and offer many benefits, including enhanced skill development, productivity, food security, and income generation (Meyer & Solms, 2022). OGS energy appliances improve comfort, safety, food security, and productivity (Hirmer & Guthrie, 2017). Mugisha et al. (2021) discovered that OGS systems improve rural health, Information and Communication Technology (ICT), and micro-enterprises. A review by Radley and Lehmann-Grube (2022) revealed that OGS expansion has positively impacted economic development in the Global South. OGS solutions may appear to be simple devices, but they significantly impact the quality of life, according to GOGLA (2020b). An investigation conducted in Kenya found moderate beneficial environmental effects, higher satisfaction from better illumination, increased people's time spent watching Television (TV), and the financial advantages of SHSs, despite the considerable electrification and expenditure consequences (Wagner et al. (2021).

2.3 DEMERITS OF USING OFF-GRID SOLAR SYSTEMS

Though OGS solutions can help individuals with their energy requirements, people have faced numerous financial, technical, and political obstacles (Singh, 2017). Service issues in OGS products are common, resulting from improper product use, manufacturing and installation issues, and inclement weather (Kundu & Ramdas, 2022). Moreover, Akter and Bagchi (2021) claimed that OGS power has the drawback of having a high upfront cost. According to Bhattacharyya and Palit (2021), the evidence suggests that decentralised solutions are considerably more expensive than central grid supplies, raising questions about fairness, equity, and justice. While OGS products provide some relief from darkness for the energy poor, Samarakoon et al. (2021) conclude that they are commodities prone to reproducing structural forms of injustice and do not always represent a sustainable solution to energy poverty in the Global South.

On the other hand, there were frequent discussions about whether the energy provided by the OGS sector is sufficient to effect meaningful change in the energy sector (GOGLA, 2020b). Galan (2021) identified a lack of policy coordination and a disconnect between the government and the OGS sector as central issues in their study. One limitation of the market-based development strategy for the off-grid sector is that companies have so far been unable to distribute products without endangering local environments (Groenewoudt & Romijn, 2022). OGS systems also have the unintended consequence of exacerbating intergenerational challenges, such as inefficient use of finite resources through mass consumption of short-lived devices and the growing ecological burden of E-waste (Samarakoon, 2020). Kinally et al. (2022) also declared a significant ecological risk from OGS products due to the growing volume of unabated waste.

3. METHODOLOGY

A literature review was conducted to identify gaps in existing research, including journals, conference proceedings, books, and electronic resources. The study has chosen a qualitative approach to match the research aim. A survey was used as the research strategy, and semi-structured interviews were employed as the data collection method.

Gathering insights from stakeholders is vital when conducting qualitative research on OGS systems. Users can provide valuable feedback on their experience with these systems. At the same time, sellers, such as OGS companies, can offer insights on selling and maintaining these systems during the current energy crisis. Additionally, it may be helpful to investigate the government authority's perspective on using these systems due to these OGS systems as a prevailing topic with power outages in Sri Lanka. By taking a holistic approach to this research, the researchers could comprehensively understand the merits and demerits of OGS systems. Therefore, as summarised in Table 1, the profile of respondents, Government Authority (GA) experts, Off-Grid Solar Service Provider Company (OGC) Experts and Off-Grid Solar Users (OGUs) were chosen as key stakeholders to obtain perspectives on using OGS systems.

Table 1: Profile of respondents

Key Stakeholders	Respondent	Profession	Awareness of the OGS concept
Off-Grid Solar Users (OGUs)	U1	Engineer	Well-Known
	U2	Entrepreneur	To Some Extent
	U3	Engineer	Well-Known
	U4	Electrical Engineer	Well-Known
	U5	Electrical Engineer	Well-Known
	U6	Electrical Engineer	Well-Known
	U7	Engineer	Well-known
	U8	Entrepreneur	To Some Extent
	U9	Professor	Well Known
	U10	Entrepreneur	To Some Extent
Government Authorities (GAs)	G1	Project Manager	Well-Known
	G2	Assistant Director	Well-Known
	G3	Director	Well-Known

Key Stakeholders	Respondent	Profession	Awareness of the OGS concept
	G4	Assistant Director	Well-known
	G5	Director	Well-Known
	G6	Assistant Director	Well-Known
	G7	Deputy General Manager	Well-Known
Off-Grid Solar Service Provider Companies (OGCs)	C1	Assistant Engineer:	Well-Known
	C2	Head of Engineering	Well-Known
	C3	Director	Well-Known
	C4	Director	Well-known
	C5	Engineer: Sales	Well-Known
	C6	Electrical Engineer	Well-Known
	C7	Electrical Engineer	Well-Known
	C8	Electrical Engineer	Well-Known

Accordingly, twenty-five semi-structured interviews were conducted using the snowball sampling method for key stakeholders. Snowball sampling can effectively analyse vulnerable groups or individuals under special care allowing researchers to access susceptible populations (Naderifar et al., 2017).

An interview guideline was prepared by engaging literature review findings of the merits and demerits of conducting semi-structured interviews. The collected data were analysed through manual content analysis, and findings were compared with the literature to ensure the reliability and validity of the findings. The developed framework was further validated by presenting it to the key stakeholders of the research study.

4. DATA COLLECTION AND ANALYSIS

The respondents were asked to comment on the merits and demerits of the literature findings and asked for additional merits and demerits of using OGS systems in the Sri Lankan context.

4.1 MERITS OF UTILISING OFF-GRID SOLAR SYSTEMS

4.1.1 Off-Grid Solar Users' Perspective

U1, U5 and U8 mentioned that solar is a renewable energy source with long-term benefits compared to coal power plants. U3 partially agreed to positive impacts on climate by explaining, "*Though the OGS systems have no direct CO_2 emission compared to fossil fuels, improper use and disposal of batteries can harm the environment*". U8 stated, "*Despite Sri Lanka being 100% electrified, OGS systems will benefit some locations with difficulty connecting to the grid*". U9 elaborated on how comfortable life is "*We do not need to look for lamps, torches, or other items during power outages. Using an OGS system, people can live comfortably during this energy crisis*". U2 emphasised that uninterrupted power supply is a limited benefit due to system capacities. U10 explained that OGS systems would positively impact reducing national grid demand.

4.1.2 Off-Grid Solar Service Provider Company Experts' Perspective

C5 elaborated that using OGS is safer than using kerosene lamps, yet there is a safety risk if the inverters are not properly earthed. C6 explained, "*During the energy crisis, people lack energy for long periods, making it challenging to complete their daily tasks.*

However, people with an OGS system can usually go about their daily life". C3 partially agreed to enhanced safety as a benefit and pointed out, "*On the one hand, there is increased safety from theft and vandalism. On the other hand, these systems have fire risks*". C8 stated, "*The risk associated with these systems is uncommon. The possibility of catching fire is negligible, primarily if good products and proper craft are used*". Further to C8, these systems have the benefit of community-based technology dividends. In contrast, C2 pointed out, "*There is currently no funding or incentive for rural communities to invest in these types of OGS systems to reap the benefits of the community-based technology dividend*". C3 explained, "*Depending on the application type used by this system, there may be some cost savings. For example, even if the initial cost is high, fuel and maintenance costs will be saved over having a generator*".

4.1.3 Government Authority Experts' Perspective

G3 pointed out, "*Even though we are 100% electrified, there are some areas where accessing the grid is prohibitively expensive. It can easily establish OGS for those areas to improve the energy access*". However, G5 mentioned, "*Though the enhanced energy access may depend on the situation, using OGS is not sustainable*". G2 commented, "*I do not think there are unique health benefits because sometimes these systems may cause safety hazards*". G5 agreed that there might be long-term health benefits. All the experts mentioned that the uninterrupted power supply is the main benefit of using these systems in the Sri Lankan context. G4 pointed out that "*Solar is a renewable energy it reduces the CO2 generation rather than coal or fuel's electricity. Therefore, these systems positively impact climate*". According to G1, cost savings are another benefit compared to fuels and kerosene in the long term. G3 declared, "*OGUs' energy independence and satisfaction with electricity requirements will help reduce government spending on large power plants. Therefore, there is a direct benefit to the national economy because if a large power plant is required, loan schemes are the financing option for the government*".

4.2 DEMERITS OF UTILISING OFF-GRID SOLAR SYSTEMS

4.2.1 Off-Grid Solar Users' Perspective

According to U2, "*The main hindrance to the OGS sector, whether there is an economic crisis or not, is that the authorities do not favour customers and businesses*". Though a few people mentioned no ROI as a disadvantage, U3 elaborated that ROI is not a primary concern explaining, "*Though ROI is based on the applications of OGS systems, having mental freedom and comfortability from an uninterrupted power supply is invaluable*". According to U7, climate conditions are an issue because users cannot expect the same conditions on cloudy, rainy days. U1 said that the lack of reliability happened due to low-quality equipment. However, U5, U6, U4, and U7 believed low-quality equipment was not a problem because the brand's purchase determined the quality. U3 explained that if solar panels are not cleaned, lichen will grow on them, and it is a disadvantage that the systems must be maintained at least three times a year. According to U6, these systems are not currently regulated by the government. U10 said that users' lack of awareness could be identified as a drawback to using OGS systems.

4.2.2 Off-Grid Solar Service Provider Company Experts' Perspective

According to C5, regarding OGS, no unfavourable restrictions exist. C3 pointed out that not having proper regulations for OGS systems is a drawback. C1 explained that, despite the high capital investment, there is no monetary Return on Investment (ROI) from OGS systems. Further, C4 clarified, "*These systems are unreliable and, after the crisis, will be obsolete for customers who require constant power*". C2 partially agreed to the lack of reliability, saying poor product quality may cause reliability issues. However, C5 said reliability depends on the system's capacity. C2 expressed, "*The primary issue with OGS systems is the lack of experience. To avoid problems, installers must carefully select equipment and educate customers*". Although there are qualified and experienced installers, C6 pointed out that many more inexperienced, unqualified people are doing OGS installations, which is a disadvantage. According to C7, maintenance issues depend upon the system components' brand. C8 indicated, "*Though using OGS systems helps to reduce national grid demand, more energy is wasted by these systems*".

4.2.3 Government Authority Experts' Perspective

G6 highlighted that it is an issue where people and companies lack technical and management capabilities. Though G1 argued that these systems are unreliable, G2 and G7 disagreed. For instance, G7 pointed out, "*People using OGS systems due to some accessibility issue or reliability issue from the grid, which evidence in these systems is reliable*". However, G4 discussed, "*Battery issues are the main concern leading to unreliable OGS systems*". Another drawback mentioned by G1 and G3 was the lack of people's awareness regarding these systems. Nevertheless, G4 disagreed with the lack of awareness as a drawback and explained, "*People do not mindlessly go for a solar system. Technical persons already know how the system works and who have less awareness can rely upon the service provider companies through service and maintenance agreements*". G7 and G3 highlighted that lacking qualified personnel is a significant drawback in Sri Lanka's OGS sector. Moreover, G7 and G4 identified not having proper regulations as another drawback for these systems. G5 explained that setting up an OGS system is a highly capital-intensive procedure with the battery prices, and most people cannot set a system capacity to match their daily power requirements due to this drawback.

5. DISCUSSION

As per the analysis of the study, Figure 1 highlights the key stakeholder perspectives on using OGS systems. The left side of the figure depicts the demerits of utilising OGS systems, while the right side showcases the merits per the perspectives of GA experts, OGC experts, and OGUs.

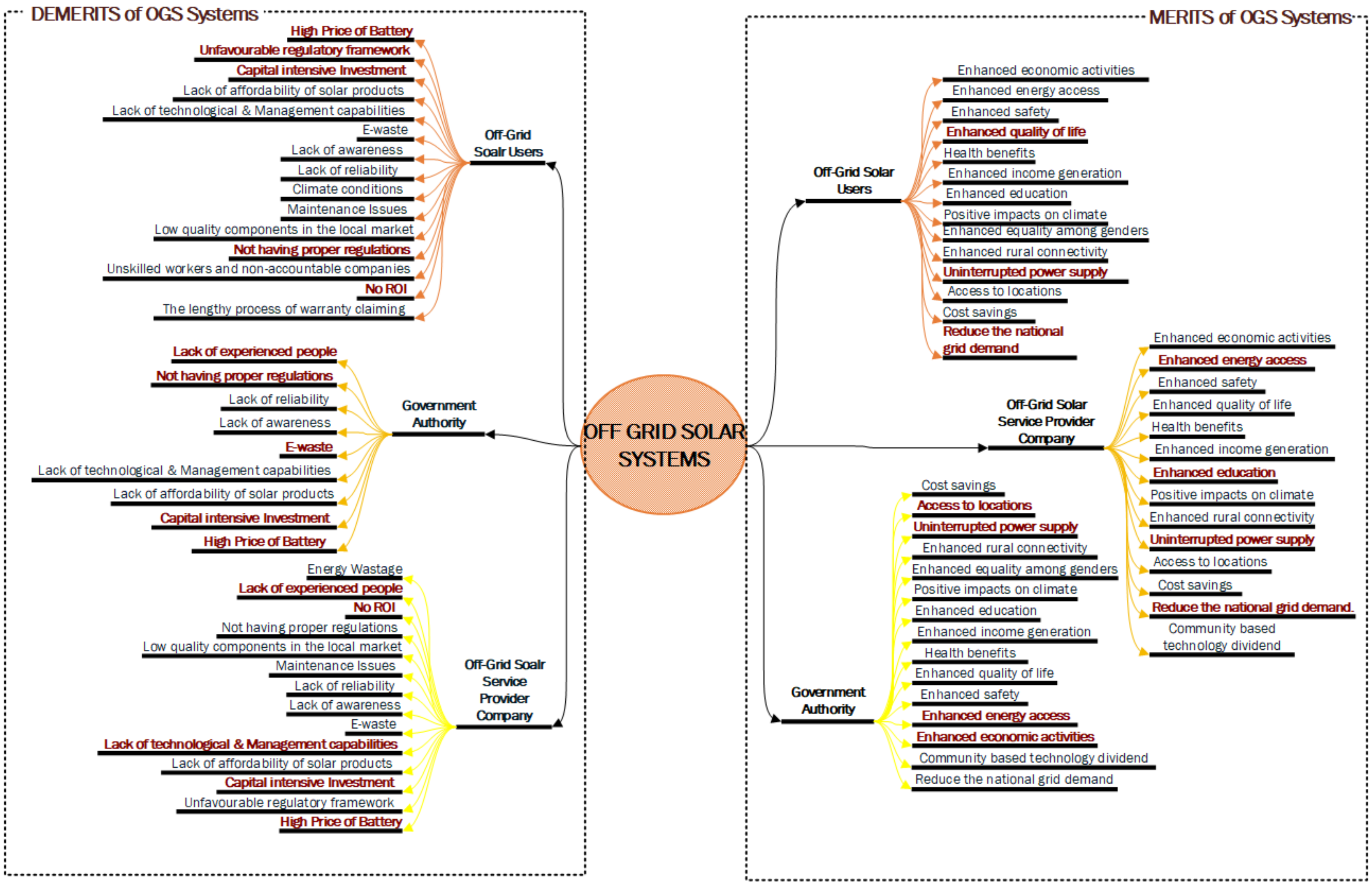

Figure 1: Summary of Merits and Demerits of OGS Systems: Key Stakeholders' Perspectives

5.1 MERITS OF UTILISING OFF-GRID SOLAR SYSTEMS

Although all respondents from OGUs and GAs agreed that using these systems **enhances economic activity**, one OGC expert (C4) had no idea, and one disagreed (C3) about this benefit. While all GA respondents agreed that **enhanced energy access** is a benefit, one from each OGU (UR4) and OGC expert (CR1) only partially agreed.

In contrast to the literature findings (GOGLA, 2019; GOGLA, 2020b; IRENA, 2022a; Wagner et al., 2021), stakeholders had conflicting opinions about the benefits of **enhanced safety** from using OGS systems. Fourteen of twenty-five respondents agreed only partially that OGS systems provide enhanced safety. Furthermore, the analysis found that this partial agreement was based on comparing kerosene lamps and other energy generation sources to using OGS systems during power outages. However, respondents pointed out that when these types of DC systems are not installed correctly according to safety procedures, they can pose a fire risk. Four out of twenty-five respondents strongly disagreed that these systems improve safety. Concerns were raised regarding the lack of safety regulations, particularly for OGS systems in the Sri Lankan context. Thus, the findings revealed that enhanced safety could only be considered a benefit in the Sri Lankan context if proper safety precautions were taken during installation. Furthermore, all respondents agreed that **enhanced quality of life is** a benefit of implementing OGS systems in Sri Lanka.

Though the literature mentioned that these systems improve community health (Hirmer & Guthrie, 2017; IRENA, 2022a; IRENA, 2022b; Mugisha et al., 2021), the study's findings indicated that this could not be directly applied to the Sri Lankan context. Six out of eight OGC respondents partially agreed, citing concerns such as the long-term release of toxic chemicals into the environment. Two GA experts agreed partially, and one had no idea about the health benefits, while four respondents agreed that there are health benefits. Seven out of ten OGUs, on the other hand, agreed that there are health benefits. Respondents who agreed there are health benefits pointed out that these systems emit no CO_2 compared to other alternatives such as kerosene lamps and diesel generators. As a whole, thirteen of twenty-five respondents agreed that these systems provide **health benefits**. Thus, in the Sri Lankan context, with some long-term concerns, health benefits can be viewed as a plus.

From the standpoint of OGCs, seven out of eight agreed that **income generation** (Meyer & Solms, 2022; Radley & Lehmann-Grube, 2022; Wagner et al., 2021) is improved. However, according to the findings, OGS systems do not have a direct Return on Investment (ROI). However, indirectly these using systems will generate income by generating solar-related jobs and allowing the community to continue working without interruptions. Eighteen out of twenty-five respondents agreed that enhanced income generation from OGS systems benefits the Sri Lankan context. Furthermore, all respondents from stakeholders agreed that these systems would **enhance education** which can benefit the Sri Lankan context.

According to the OGC experts, four out of eight only partially agreed, while others completely agreed that these systems **positively impact climate**. Only five GA experts fully agreed, one had no idea, and one partially agreed that there are positive effects. From the perspective of the OGUs, eight fully agreed, while two partially agreed. Although there are no CO_2 emissions, the partially agreed respondents are concerned that these systems will result in long-term E-waste for the environment. However, based on the overall responses, using OGSs positively impacts the Sri Lankan context. Experts from the GAs agreed that they could identify **improved gender equality** (GOGLA, 2020b; IRENA, 2019) using these systems, whereas five OGC experts had no idea, and three disagreed. From the perspective of the OGUs, seven had no idea, three disagreed, and only one agreed. According to the findings, enhanced gender equality using OGS systems cannot be viewed as a benefit in the Sri Lankan context.

Regarding **enhanced rural connectivity (**IRENA, 2019; IRENA, 2022a; Meyer & Solms, 2022;), the GA experts agreed six out of seven times, while the OGC agreed seven out of eight. According to the OGUs, one had no idea and only seven agreed. Because Sri Lanka is nearly fully electrified, respondents who disagreed or partially agreed remarked that this benefit does not apply in the Sri Lankan context. Nonetheless, GAs experts confirmed that Sri Lankan villages, such as 'Galamunduna,' generate energy through mini-grid off-grid systems. Another concern was that rural people in Sri Lanka needed these systems to be more affordable to install. However, the majority agreed that improved rural connectivity could benefit the Sri Lankan context. Overall, the study identified significant benefits of having an uninterrupted power supply and reducing the national grid demand.

5.2 DEMERITS OF UTILISING OFF-GRID SOLAR SYSTEMS

When considering the **high battery price** (Delgadillo et al., 2022; Mugisha et al., 2021; Wattana & Aungyut, 2022), all respondents from the GAs and OGUs agreed that it is a disadvantage for these systems in the current context. According to the OGCs, seven out of eight agreed, with one partially agreeing. Overall, it was discovered that the high battery price is a significant disadvantage of using these systems and that the ongoing energy crisis has caused a rapid increase in battery prices. All the GAs respondents disagreed, stating that Sri Lanka has no **unfavourable regulatory framework** (Hoeck et al., 2022; Jensen et al., 2019; Wattana & Aungyut, 2022) for these OGS systems. Furthermore, experts from the GAs have revealed that a guideline preparation for the OGS systems is underway and has yet to be published. Thus, it was determined that no regulations were imposed during the data collection period, particularly in the OGS sector.

Nonetheless, when it comes to OGUs and OGC experts, they have no information on the government's guideline preparation, and six out of eight OGCs disagreed with this as a drawback. Six out of ten OGUs, on the other hand, disagreed with this as a drawback. Overall, the study indicated that while the literature has identified an unfavourable regulatory framework as a disadvantage in the global context, there are no regulations for this sector in the Sri Lankan context at the time of data collection. As a result, the study's findings reject this as a disadvantage in the Sri Lankan context.

All stakeholders agreed that these systems are **capital-intensive**, a disadvantage for the Sri Lankan community. Furthermore, twenty-four out of twenty-five respondents cited the lack of affordability of solar products as a disadvantage in the Sri Lankan context. The next disadvantage identified in the literature was the **lack of technological and management capabilities** (Jensen et al., 2019; Mugisha et al., 2021; Samarakoon, 2020; Hoeck et al., 2022), which twenty out of twenty-five respondents identified as related to Sri Lanka. According to the findings, the government and the private sector in Sri Lanka lack technological and management capabilities for the OGS sector.

Most respondents considered **E-waste** a disadvantage but emphasised that this is not the case in the current context in Sri Lanka. However, findings revealed that E-waste could adversely affect the future due to Sri Lanka's lack of a recycling plan for solar components. On the other hand, two OGC experts and one GA expert pointed out that the OGCs could manage this E-waste in the future when they occur. The unavailability of proper regulations, no ROI, high capital-intensive investment and the lack of qualified people have been identified through findings as significant drawbacks to using OGS systems.

6. CONCLUSIONS AND RECOMMENDATIONS

Amidst the current energy crisis in Sri Lanka, many people have opted for OGS systems to fulfil their energy requirements instead of hybrid or on-grid systems. Therefore, this study aimed to investigate the merits and demerits of OGS systems from the key stakeholders' perspectives. The merits and demerits were identified in Sections 2.2 and 2.3 of the literature review and presented to the key stakeholders in semi-structured interview guidelines for comment. Enhanced gender equality was rejected from the findings from the merits in literature, but having an uninterrupted power supply and reducing the national grid demand were some of the significant benefits identified by the study. On the other hand, from the demerits in the literature, the unfavourable regulatory framework has been identified as irrelevant to the Sri Lankan context. The unavailability of proper regulations, high- capital-intensive investment, no ROI and a lack of qualified people have been identified through findings as significant drawbacks to using OGS systems. The study emphasised that it is vital to consider all stakeholders' perspectives regarding the potential merits and demerits of utilising OGS systems to have informed policy decisions for the OGS sector in Sri Lanka. It is recommended that government authorities should incorporate OGS systems to get uninterrupted power supplies and access energy where the grid system is unreliable. As a further research direction from this study, the viability of OGS systems in the Sri Lankan context using a cost-benefit analysis can be investigated.

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