Determining Adoption Rates of Sustainable Energy Technologies in Kakuma Refugee Camps

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Abstract: Since the beginning of the century, the need for adopting sustainable energy technologies (SET) has been of concern worldwide. This is because renewable energy sources have significant potential to contribute to the economic, social and environmental sustainability. However, despite the practical and convincing technologies on sustainable energy, the adoption rates have been quite low especially in resource constrained nations and communities. The effects have been greatly felt by humanitarian actors, host communities and refugees. The purpose of this study was to determine the adoption rate of sustainable energy technologies in Kakuma refugee camp. The study adopted concurrent descriptive cross sectional research design. Both simple random and purposive sampling methods were used to sample respondents for questionnaire administration and key informant interviews respectively, while census was adopted for focus group discussion and observation. Data was analyzed descriptively using SPSS. Descriptive results were presented in tables and charts. The results show that majority of the respondents were effectively sensitized on cooking and lighting sustainable energy technologies. About 64% and 36% of their time is spent on cooking and lighting respectively, with all (100%) households owning firewood cook stoves, followed by charcoal cook stoves (65%) and kerosene stoves (55%). Only 30% of the household owned LPG cookers while those using alcohol and solar cookers were 8 and 5 % respectively. The average adoption rate for cooking and lighting using sustainable energy technologies was 30% and 64% respectively. Despite spending majority of their time (64%) cooking, the adoption rate for SET was only 30%. The average adoption rate of SET in the camp which is the sum of the weighted averages of household adoption rates for cooking and lighting was established as 40.39%.

Keywords: *Adoption rate, sustainable energy technologies, kakuma refugee camp, cooking, lighting,*

Introduction

Energy services are of critical importance to displaced people, many of whom live in temporary shelters exposed to extreme temperatures. Many countries with large numbers of displaced people already suffer from wider resource stress that manifest for example in deforestation and energy poverty. Thus, additional competition for fuel can exacerbate tensions between local and displaced communities (Grafham, 2015). Because of its efficiency, sustainable energy (SE) technologies can transform the situation if its adoption is escalated especially in humanitarian communities. Sustainable energy sources improves access to energy and reduce emissions of greenhouse gases (Hulme, 2009) and may create local socioeconomic development opportunities (Morales, 2017). Adopting sustainable energy is a crucial factor in achieving the UN's Sustainable Development Goals (SDGs) set forth in the 2030 Agenda.

Current state

Energy needs in humanitarian settings present complex social, development, and logistical challenges that require a robust solution. Around 90 per cent of the displaced people living in camp settings, don't have access to electricity and 80 per cent rely on traditional biomass for cooking that include wood, charcoal or animal waste (Grafham, 2015). Providing sustainable energy has long been a major challenge for local authorities, humanitarian agencies, local communities and refugees themselves (Lahn, 2015). Refugees generally have limited access to sustainable solutions. Most depend on insufficient humanitarian agency monthly supply of firewood or have to travel long distances to collect firewood.

This exposes, especially women and girls to the risk of attack or sparking conflict with host communities (UNHCR, 2016). The frequency of firewood collection was found to be an important proxy in both the refugee and host community groups for exposure to gender based violence (GBV) with evidence suggesting that there may be a reduction in the exposure to GBV with a reduction in the frequency of firewood collection (Rosenbaum, et al., 2015). In addition, the inefficient use of energy by displaced people in the world is a cause of premature death for 20,000 displaced people each year (Lahn and Grafham, 2015).

In order to ensure safe access to fuel and energy, a set of activities that addresses the root causes of energy challenges in these contexts are required to help protect both people and the environment. A World Food Programme (WFP) initiative in Darfur, proved successful in limiting gender based violence and harassment, with 86% of women reporting less or no harassment as they switched from collecting firewood to using briquettes, improved stoves, and safer livelihood activities.

In many cases, host governments are recognizing the environmental damage and are now pushing for change, banning in-kind firewood distribution or requesting humanitarian agency support to transition refugees to alternative fuels (Mallet, 2016). Increased adoption and diffusion of Renewable Energy Technologies (RET) is critical in this context (Stern, 2007). The appeal of renewable energy has risen due to its potential for reducing dependence on energy imports (Valentin, 2011). At the same time, renewable energy offers possibilities for generating local environmental and health benefits along with the facilitation of energy access (Mahapatra and Gustavsson 2008).

However, there is limited policy and practice on sustainable and clean energy provision within the humanitarian community (Chatham House, 2015). This means that the energy needs of millions of displaced and refugee people are being met inadequately (GIZ, 2017) and inefficiently (Bailey, Lahn & Grafham, 2017), and not through the most effective or carbon-efficient interventions (Bensch, 2016). Globally, 87.9 % of refugees and displaced people cook with biomass in camps, 98.5 % of refugees and displaced people are off-grid in camps and refugees and displaced people spend a total of $ 3,229 million annually on energy (MEI, 2018). Further, according to Bensch, (2016) only 11% have access to sustainable energy and the immediate benefit of sustainable energy through improved lighting and efficient cooking and heating.

Several challenges exist for long-term energy planning in humanitarian settings. One of the main challenges to providing durable solutions of energy access to displaced populations lies in the different approaches taken by humanitarian and development actors (Gunning, 2014). On the one hand, humanitarian agencies try to meet the acute needs of refugee populations in the fastest possible way, mostly providing free resources directly to the populations (Morales, 2017). Another common challenge is the legal status of the refugees that result in lack of accessing work permits. In other cases it is the political instability and local political leaders seeing sustainable energy access in humanitarian settings as a threat to the stability of their own countries because it indicates that the settlements are becoming formalized (Franceschi, Rothkop & Miller, 2014).

Over reliance on biomass fuel sources drive refugees into clearing trees and vegetation cover. A Kenya Forestry Research Institute report indicate that formation of Kakuma Refugee Camp led to depletion of trees and vegetation cover in the region, causing massive devastation of environment (KEFRI, 2008) . Absence of sustainable fuel supplies also impact negatively on nutritional standards as refugees barter-trade away their limited food rations with local charcoal (WFP, 2010).

Theoretical underpinning

The theory of planned behavior (TPB) and the the theory of reasoned action (TRA) are some of the most widely cited and applied behavioral theories. TPB consists of three conceptual determinants of the adoption of a new technology, these include the attitude towards the technology, social factors like the perceived social pressure on either to use or not to use the technology and facilitating conditions such as availability of government support and technology support. According to Brown, Massey and Burkman (2002) the theory states that both attitude and social factors are important determinants of peoples intention to adopt technology.

The theory of reasoned action on the other hand provides a model and explains how and why attitude affects behaviour (Ajzen & Fishbein, 2017). According to the theory, intention to perform certain behaviour precedes the actual behaviour. This intention is known as behavioral intention, and comes as a result of the idea that performing behaviour will lead to a specific outcome (Azjen &Madden, 2016).

The TRA is applicable in this study to conceptualize human behavioral pattern in a decision-making process on selecting a suitable sustainable energy solution. It is helpful in predicting that decision by refugee households to select the most favorable sustainable energy technology is pegged on behavioral intentions, which are a function of an individual's attitudes. The subjective social norms surrounding the performance of sustainable energy, the individual's perceptions of ease with which the cooking can be performed with different fuel choices and the individual's attitudes on different cooking and lighting.

Information gaps

Despite extensive research in the area of sustainable energy, majority of these studies have been carried out by humanitarian agencies whose findings are based on an insider's eye in line with donor funding opportunities. A study by Mamuye, Lemma, Woldeamanuel, (2018) focused on gender aspect influence on adoption of improved cooking stoves which was narrow in scope since it studied a single aspect of wider renewable energy drivers. Further the study was carried in an Ethiopian and not a Kenyan context. The study by Jan *et al.* done in Pakistan and Troncoso *et al.* in Mexico were done in a different setting distinctive from Kakuma refugee camp in Kenya.

A survey by Lahn and Grafham, (2016) on the influence of aesthetics on adoption of solar power found out that the aesthetics of solar panels was mentioned by 40% installers as a key factor when selecting a panel to recommend to homeowners. However, the study targeted home owners who are endowed with resources unlike refugees who rely on humanitarian aid. This study sought to fill the gap by assessing holistically the determinants of adoption rates of Sustainable energy technologies in Kakuma refugee camps.

Majority of literature employed only applied qualitative methods to draw findings and conclusions. This has limitations. This study adopted concurrent descriptive cross sectional research designs to produce findings which are more informative. Despite an increase in the number of energy-related activities in recent years, there appears to have been limited literature of their impacts on the refugee setup. There is however huge literature confirming that sustainable energy offers a good and sustainable potential to contribute to the energy needs of modern society if improved production and consumption technologies are used.

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Access to modern energy is a basic human need, but more so for displaced people who are more disadvantaged often due to inadequate access to safe, secure and reliable energy. In refugee camps, sustainable energy solutions will not only generate many benefits for camp inhabitants, but hosts, camp operators, and for the environment as well. Appropriate energy technologies properly delivered offer opportunities for improving conditions and self-reliance of refugees. While SE technologies are available adopting them has been a major challenge for humanitarian actors and refugees themselves yet there exists limited empirical studies to address this concern. A better comprehension of the refugees actual situation is needed and yet a few studies address this crucial issues. The goal of this study was therefore to determine the adoption rates of sustainable energy technologies in Kakuma refugee camps.

Research Design

This research adopted concurrent descriptive cross sectional research design. The choice of this research method was primarily to collect qualitative data to illustrate quantitative findings. This enabled the researcher to collect both quantitative and qualitative data that focused on generating detailed information regarding the key aspects.

Study Population

As of August, 2019 Kakuma refugee camps had 191,500 refugees (UNHCR (2019) out of which 1000 formed the study population. Further, the study did a census to 13 zonal leaders in the camps for focused group discussions, selected 29 lead persons drawn from UNCHR implementing agencies and did a census for 10 sustainable energy market organizations.

Sampling Strategy and Sample Size

The current study employed simple random sampling technique to sample refugees in Kakuma refugee camps. Purposive sampling was used to select UNHCR implementing partners. In choosing the sample for FGDs, and observation, census was used. The Slovins statistical formula was employed to obtain the study sample size as follows.

$$n = \frac{N}{1 + N(e)^2}$$

Where; n= sample size, N=Population, e = level of precision

$n=1000 / (1+1000 (0.05)^2) = 286$ respondents

For focus group discussion, census design was used since the population of interest was smaller. However for interview, 29 lead persons drawn from 42 implementing partners in Kakuma.

Data Collection Instruments and Procedure

Primary data was collected using questionnaires, interview, focus group discussion guide and observation checklist which were administered by the researcher with the help of research assistants. Quantitative data was collected by use of structured questionnaire. The questionnaires were constructed with closed and open-ended set of questions with a five-point Likert scale and administered to 286 respondents. The research instruments were first pilot tested in a study involving 30 refugees drawn from resettlement camps that were not part of the sampled population. The pilot study was undertaken to gain feedback on clarity and validity of the instruments and time taken by respondents.

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For open-ended questionnaires the respondents were required to use their own words to answer questions, whereas in closed-ended questionnaires pre-written response categories were provided. The questionnaires were administered using 'drop-and-pick' method. This provided convenience and efficiency in the process of data gathering. For Key Informant Interviews, an interview schedule was used to conduct a set of the oral questions during the interview. Before the interview, the interviewer gained a rapport with the respondent. The respondents answered identical questions at individual level to maintain confidentiality and to control bias among the respondents.

Two focus group discussions comprising 7 and 6 zonal leaders respectively were used to explore their ideas on ownership and adoption of new cooking and lighting technologies. The topics for discussion were modeled from the research questions, questionnaires and interview schedule.
Observation was used to explore the SE technologies in the Kakuma market place where all the 10 SE market organization were visited, observed and photographs taken.

Secondary data was used to supplement the primary data collected and identify critical grey areas the study sought to fill. The sources of data reviewed included journals, publications, online reports and statistics from the government ministries such as energy and donor agencies working in Kakuma refugee camp. The secondary data was useful in corroboration of the study findings.

Data analysis

Quantitative methods of data analysis were used to analyze the data collected. Quantitative information was analyzed through statistical procedures. Pearson's correlation analyses was used to explore the relationships among determinants of adoption rates of SET and SET adoption rates. The adoption rates of SET were determined as follows:

$$A_{set} = W_c A_c + W_1 A_1 \qquad (3.1)$$

Where

A_{set} is the adoption rate for SET

W_c is Cooking weight

A_c is adoption rate of SET in cooking

W_l is lighting weight

A_l is adoption rate of SET in lighting

Weights were determined based on the average duration required for cooking and lighting as obtained from the field where

$$W_c = \frac{T_{ac}}{(T_{ac}+T_{a1})} \qquad (3.2)$$

$$W_1 = \frac{T_{a1}}{(T_{ac}+T_{a1})} \qquad (3.3)$$

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Where

T_{ac} is the average time the household spends in cooking

T_{al} is the average time the household spends in lighting

The adoption rates for cooking was determined in % based on the field data as follows:

$A_c = CC + CE + CL$……………………………………………………………(3.4)

Where

CC is % of time cooking with charcoal

CE is % of the time cooking with ethanol

CL is % of the time cooking with LPG

The adoption rates for lighting was determined in % based on the field data as follows

$A_1 = LB + LR + LS$……………………………………………………………(3.5)

LB is % of time lighting using battery torch

LR is % of time lighting using rechargeable torch

LS is % of lighting using solar home system

Qualitative data generated from the interviews, FGDs and observation were used to illustrate the quantitative findings.

Data presentation was done by the use of charts, percentages and frequency tables. Inferential statistics were used in drawing conclusions

Results and Discussion

Awareness of sustainable energy technologies

Awareness was considered important as it influences the adoption of sustainable energy technologies. The results showed that 93% and 85% of the respondents had been sensitized on cooking and lighting sustainable energy technologies while 87% of the respondents had been sensitized on both lighting and cooking sustainable energy technologies. The results indicate the respondents have been exposed to sustainable energy technologies and thus can make informed responses. One informant remarked that;

> *Majority of us have been introduced to modern cooking technologies that use less energy and do not produce smoke thus good for our health. Also many private companies have sensitized us on their products such as D- light that is being used by a good size of refugee household.*

Effectiveness of sensitization on sustainable energy technologies is demonstrated by the fact that 98% understands the basis of sustainable energy. This implied that majority of the respondents had exposure expected to enable them access requisite information and knowledge about sustainable energy technologies. This further explains that the sensitization focused on the key drivers for sustainable energy technologies that include human and environmental health. One key informant said that;

The sensitization programs by SNV are geared toward understanding what is sustainable and what is not sustainable. They actually provide manuals on the health and environmental benefits of cooking and lighting sustainable technologies.

It was observed that the respondents had training materials that detailed the benefits of clean cooking and clean lighting. Based on a focus group discussion it was evident that most of the respondents sensitized understood sustainable energy technology as they could identify sustainable technologies in the context of the camp settings. One of the discussants remarked that:

In the camp, the most appropriate lighting solution is a 3 bulb solar home system to cater for the light requirement in the bedroom, kitchen and family common area. This can be afforded by majority of the families if the initial payment is converted to PAYGO plan

These findings are corroborated by Akinwale and Adepoju, (2019) who showed that creating awareness and knowledge about renewable energy, adequate government policies, trust, peer-effect, development of renewable energy markets and technology acceptance factors are all positive and statistically significant in influencing the willingness to adopt renewable energy technologies among the micro and small enterprises.

Time Spent on Cooking and Lighting

Time spent on cooking and lighting was considered important as a weighting factor in determining household adoption rates. Results show that the average time spend in cooking is seven hours that represents 64% of the time energy is required in a household for cooking and lighting while the average time spend in lighting is four hours that represents 36% of the time energy is required in a household for cooking and lighting. Many factors explain why there is much time spent in cooking including time spent to gather fuels, inefficient cook stoves and the fact that cooking energy is used for other social benefits like heating and family gathering round fire places. During an interview one key informant remarked that;

While the firewood distributed to the refugee serves for their cooking needs, also serves other indirect benefit like promoting socio cohesion, keeping snakes away and general security.

A report by GIZ, (2017) corroborates the findings with the results that showed the average time taken by the households to prepare a whole-meal for a house size of 6-8 individuals is 5-6 hours on traditional three stone oven. According to United Nations High Commissioner for Refugees. (2017b), the household vulnerability study established the median household size in Kakuma Refugee camps is 6-7 individuals.

Level of Ownership of Cooking and Lighting Technologies

The level of ownership of cooking and lighting technologies was considered in corroborating the findings of the household adoption rates for cooking and lighting technologies.

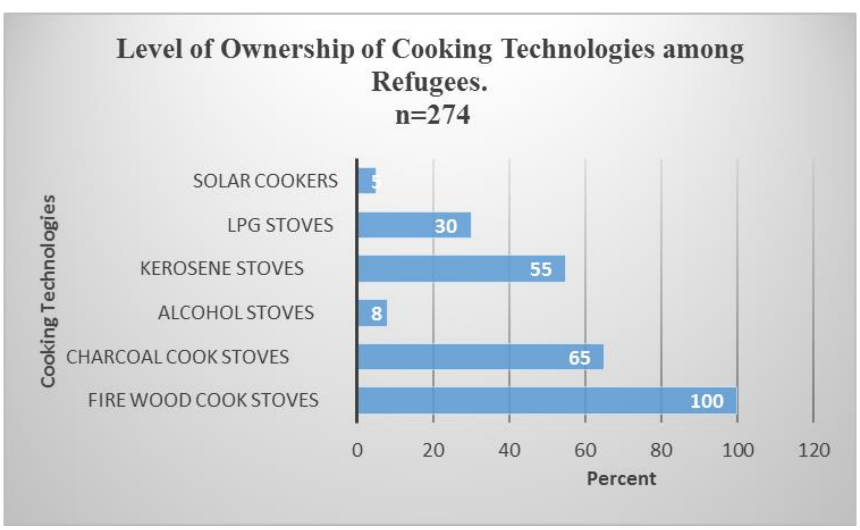

Figure 1: Level of Ownership of cooking technologies among the respondents in Kakuma Refugee Camps

The Kakuma refugee population owning firewood cook stoves is high indicated by 100 percentage. In the households, 65% of the population own charcoal cook stoves, 55% own kerosene, 30 % own LPG stoves while only 8 and 5 percent own alcohol stoves and solar cookers respectively. The high level of ownership of firewood and charcoal cook stoves can be motivated by the fact that the UNHCR provide free firewood to the refugee as an aid and that firewood and charcoal are readily available from the host community. Low adoption of the alcohol stoves and solar cookers can largely be explained by the unreliability of the supply of the bio-ethanol in the market, high cost of the solar cookers and that cookers can only be used during the day and when there is sunlight.

A study by Stockholm Environment Institute (2016) on the journey to clean cooking corroborates the findings with its conclusion that the main motivating factors for buying a stove were the prospect of saving money and/or fuel, added convenience, and the aesthetic and aspirational appeal of the stove.

The duration of stay in the camp was important in establishing its relationship with the adoption rate. Irrespective of the length of stay in the camp, population owning firewood cook stoves remained high indicated by 100 percentage. This is largely explained by the fact that firewood is what is provided by the UNHCR as the humanitarian assistance in energy in the Camps. However, the population owning charcoal cook stoves within the households varied with the length of stay as indicated by about 89 % for those who had stayed below 5 years and about 48% for those who had stayed over 21 years. One key informants stated that;

> *The emergence of affordable new cook stoves that uses both charcoal and fire wood has led many refugee household abandon fire wood cook stoves.*

In addition, the population owning kerosene cook stoves within the households varied with the length of stay as indicated by about 11% for those who had stayed below 5 years and about 80% for those who had stayed for over 21 years. One FGD discussant remarked that;

> *The new refugee arrivals are being discouraged from using the kerosene cook stoves in the camps. But for us who have been here for long and own the stoves and given we can get quantities of paraffin as per our abilities, we find it difficult to discard them.*

The population that owns the alcohol and solar cook stoves is low irrespective of the length of stay in the camp as indicate by an average of about 7 and 4 percentage respectively.

On the other hand, the population owning tin lamps within the households in camps was found to be high indicated by 96%. In the households, 85% of the population own battery torch, 60% own rechargeable torch and only 5 percent own solar home system. The low cost of acquisition of tin lamps and reliability of kerosene supply within the camps explains the high level of ownership of tin lamps. Moderate ownership of battery and rechargeable torches is motivated by the aesthetics and relatively low cost as compared to solar home systems. One FGD discussants remarked that;

> *Most of us own tin lamps because they are affordable and we can get kerosene amounts according to our ability. We use torches for security purposes. On the issue of solar home system the high cost is the limiting factor in acquisition.*

Ownership of tin lamps and battery torches remained high across all the year of stay bands while the ownership of solar home system remained low across all the year of stay in the camp. This is because the tin lamps and battery torches are relatively affordable to refugee population as opposed to the solar home system. The affordability contributes to the high level of ownership.

Level of Adoption of Cooking and Lighting Technologies

The level of use in percentage of time spent using cooking and lighting technologies to address their daily cooking and lighting needs was used to establish the baseline household adoption rates for cooking and lighting.

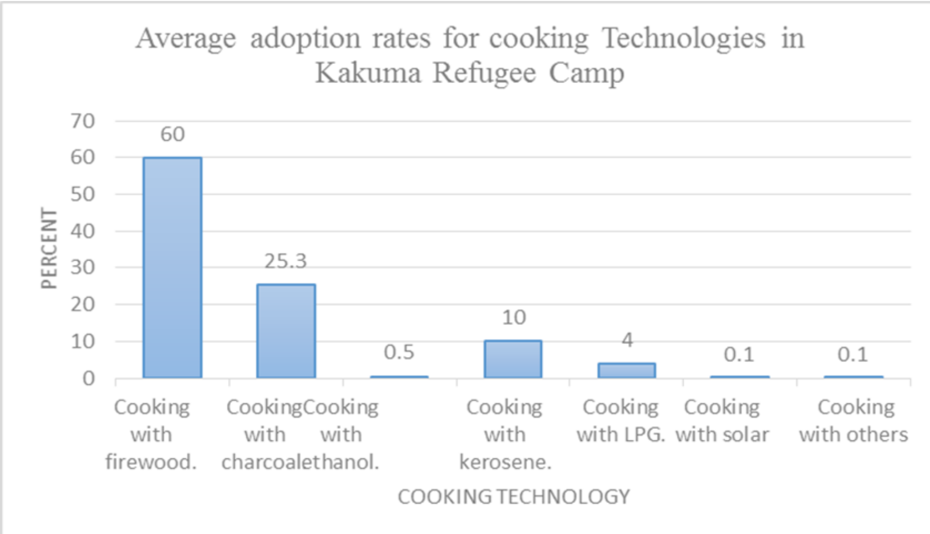

Figure 2: Average Household Adoption Rates for Cooking Technologies in Kakuma Refugee Camps

The population in Kakuma refugee camps meets 60% of their cooking energy needs using firewood, about 25% of the cooking energy using charcoal, 10% using kerosene and only about 5% using LPG and ethanol combined. The average household adoption rates of SET in cooking which comprise the percentage of the time the energy demand is met through charcoal , ethanol, LPG and solar was about 30%.

The figures on the level of use of charcoal compares with the national averages as shown in the Kenya cooking sector study 2019 where 65% of households in Kenya use wood as the primary cooking fuel. The national averages on LPG at 19% and charcoal at 10% differ with Kakuma averages due to poor infrastructure that hinders delivery of LPG, limited distribution channels of LPG and the fact that charcoal is readily available from the host community.

With regard to average adoption rate for lighting technologies, the population in the camps meet 50% of their lighting energy needs using battery torches. In the households, 35% of the lighting energy is met using tin lamps, 10% using rechargeable torches and only 4% using solar home system. The average household adoption rates of SET in lighting which comprise the percentage of the time the energy demand is met through battery torches, rechargeable torches, and solar home systems was established as 64%. One FGD discussant remarked that;

> *The use of torch batteries is preferred because torches are affordable and batteries provide sufficient warning sign that allows us time to prepare for replacement. Tin lamps though affordable are being discouraged by UNHCR and majority of us are heeding to the advises.*

The average adoption rate of SET in the camp which is the sum of the weighted averages of household adoption rates for cooking and lighting was established as 40.39% . This implies on average the households uses SET 40.39% of the time in meeting cooking and lighting needs. The other times 59.61% households use inefficient fuels to address the cooking and lighting needs. This translates to the length of time the household are exposed to health hazards and generates green house gases due to smoke as a result of cooking and lighting.

Descriptive Analysis of Adoption Rates

The population using cooking stoves within the households in refugee camps is moderate as indicated by a mean of 3.56 and standard deviation of .455. Many factors explain why there is low adoption of cooking stoves including family size and cost of fuel among others. One key informant remarked that;

> *The small cook stoves are insufficient for family size 5 and above. We prefer to use firewood on a three stone fire which can be adjusted to fit our different sizes of cooking pots.*

The number that had adopted the use of solar systems for lighting is small as indicated by a mean of 2.47 and standard deviation of .386. This is explained by the fact that solar technologies have not been regularized and many refugees have low confidence on their durability. Equally, the high affront cost that is beyond the means of the many refugees limits the adoption of solar home system. One FGD discussant remarked:

> *Solar technologies have no common benchmark. Today we have sunken lights, yesterday we had Azuri light and the list goes on and on. What is the real difference? Which one is better than the other and has value for money?*

Many studies have opined that achieving universal energy access will require policies that address not just the energy sector (Dieperink, Brand, Vermeulen, 2005) but also regulatory, financial, and infrastructure policies that lower the cost of grid and off-grid electricity and clean cooking solutions (Pachauri et al., 2013).

The population using solar systems is low as indicated by a mean of 2.21 and a standard deviation of 1.123. The low level of solar cookers is expected due to the increased time for cooking, unreliability of solar and also initial cost. One key informants remarked as follows:

> *Solar cookers cannot be used for all food types and they tend to increase the cooking time and consequently altering the food taste. To adopt such a technology will also require a shift on the cooking habits. We take tea at 7am, and if I was to use solar cooker it will require me to wait until 9am when we have sun and thus getting late for my business.*

A research outcome by Bergasse and Paczynski,(2012) corroborates the findings with the study conclusion that solar cooking can be very effective but has restricted potential, as experience shows that even among users familiar with solar cookers it generally only meets around 25–33 percent of cooking needs. It relies on high levels of sunshine and appropriate placement.

There is high usage of solar systems in electronics devices by households within the camps as indicated by a mean of 4.35 and a standard deviation of 0.699. This could be as a result of increased demand for communication between refugees and their relatives abroad and multi-purpose nature of telephone for money transfers, business transactions and information. One FGD discussant remarked:

> *My telephone must be fully charged at all times to keep in touch with my other members of family in Southern Sudan. My phone enables me to monitor the peace process in my country and this brings hope that one day we shall unite.*

A study by Hargreeves, (2017), that corroborates the findings concluded that the entry-level solar products are common, but these meet only the most basic lighting and charging needs.

The study found a high usage of battery for lighting within households as shown by a mean of 4.96 and a standard deviation of 0.188. This high adoption is largely due to availability of a wide range of sizes of battery torches of differentiated cost that are affordable within all economic strata's in the refugee camps. Also this can be explained by the fact they are easy to use and serve as an emergency lighting option.

One key informant remarked:

Refugees need to keep touches for basic lighting and in case of emergency. When a woman gets labour at home where most deliveries occur, it is important to have a touch to ensure safety during delivery.

The study agrees with Global Village Energy Partnership (GVEP) international field survey in Dadaab refugee camp (2015) which concluded in the Dadaab camps in Kenya, 61 per cent of households rely on no more than a torch for lighting.

Conclusion

The adoption rate for cooking using sustainable energy technologies is only 30% compared to 64% adoption rate for lighting, yet the household spent most (64%) of their time cooking compared to only 36% on lighting. The results of this study may enable sustainable energy market organization design effective strategies to stimulate adoption of sustainable technologies for cooking as well as for implementing partners to further formulate humanitarian programs aimed at improving sustainable energy provision in refugee camps. This study has added to the volume of literature from Africa on determinants of adoption rates of sustainable energy technology. It also lays foundation for further academic inquiry on diverse facets of humanitarian work in refugee camps and in the general energy targeting the poor.

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