Original Research Article

Perception and Knowledge of Solar Photovoltaic Technology in Climate Change Mitigation by Households in Embu County, Kenya

Abstract

Climatic changes continue to impact our ecosystems and livelihoods globally. In the past few decades, have experienced an increase in unpredictable and extreme weather events, precipitating to the three planetary crises of biodiversity loss, climate change and pollution. Embu County in Kenya has not been spared from the resultant climate change impacts. Although globally solar energy is promoted as a sustainable source of energy, its uptake in Embu County remains low. The study sought to assess the uptake of solar photovoltaic technology by households in climate change mitigation and identify the determinants of solar photovoltaic technology uptake. Cross sectional data from a sample size of 395 households in Mbeere- north Sub County in Embu County was collected using data collection tools including questionnaires, interviews, and observations. Purposive and simple random sampling was employed to select the respondents for inclusion in the study. After data collection, qualitative and quantitative data analysis methods were employed to analyze the data including SPSS (statistical package for the social sciences). The results indicate an overall increasing temperature and overall decreasing rainfall in Embu County. Income demonstrated a greater influence compared to other factors in determining the decision to adopt solar appliances at $p = 0.397$. A significant proportion of respondents (36.9%) reported having limited awareness of climate change and its impacts. Social and mass media were main sources of climate information. There was a positive significant correlation between respondents who displayed awareness of climate change and its impacts and the adoption of solar energy and awareness on solar energy adoption as a solution to climate change at p values of 0.348 and 0.140. The results assisted in assessing the uptake of solar photovoltaic in climate change mitigation in Embu County and identify the determinants driving households on the uptake of solar photovoltaic technology.

***Keywords**: Solar Energy, Climate Change, Climate renewable energy*

1. INTRODUCTION

According to International Energy [1], the utilization of clean renewable energy is now recognized as a great mechanism of driving towards sustainable development and achievement of the world set (SDGs) Sustainable Development Goals [1-2] (Yasmina , et al., 2022); (Agency, 2015). The access of energy services needs to be highly affordable and convenient to effectively meet all the required and basic energy requirements mostly in the world's developing countries and most importantly in low-income households globally. In consonance with the World Bank the metric of persons who did not have access to electricity by the year 2019 were approximately 759 million and it is estimated that by 2030 and estimated 660 million people would still not be connected to electricity [3] (The World Bank

Group, 2021). Therefore, many households continue to rely on kerosene for cooking and lighting purposes. Moreover, usage of fossil fuels is linked to health and environmental problems resulting from indoor air pollution. The WHO estimated that over 3.8 million persons a year die prematurely from different illness that are directly attributed to the household air pollution resulting from the inefficient utilization of solid fuels and kerosene for cooking [4] (World Health Organization, 2021). In the same way, dependence on traditional sources of energy like dung cake, charcoal, fuelwood, and crop residue in rural households has seriously threatened the loss of agricultural productivity, forest cover, and ecological disruptions. Therefore, the general consensus promotes the shift from the utilization and over dependence on traditional energy sources and now focus on the modern sources of energy (renewable clean energies) to help relieve the induced pressure on our ecosystems, improve the existing living standards in the society which includes households and help expedite green sustainable development. While most of the countries have a high potential of renewable energy, approximately 700 million people in Africa have no access to basic electricity connections [5]. Most of these population resides in the rural areas and electricity in these areas is a huge problem and hence are greatly impacted by the efficient accessibility of renewable and clean energies.

Kenya is home to an estimated 53.77 million people and most, resides mainly in the rural areas [6-7] (World , 2020)(IFAD, 2022) with low electrical grid connectivity. According to [8] (Energypedia, 2022) the existing installed capacity in Kenya is of 2.3 MG. Approximately 57% of the installed capacity is hydro power, while 32% of the installed capacity is in thermal and the remaining is comprised of geothermal power. Solar photovoltaic and wind power, however green energy, plays an inconsiderable part contributing only 2%. Households in Kenya result to using the following source for their lighting needs: Electricity - at 15% of the total population. Source of lighting (electricity) in the urbanized areas at - 42%; however, kerosene lamps remain at 55% as the main source of lighting in these households, and in rural households' kerosene is used for lighting purposes at - 87% [8] (Energypedia, 2022), [9] Households in the rural areas who are off-grid, solar photovoltaic becomes the suitable clean energy option. Initial purchase and installation of solar photovoltaic attracts high capital investments, therefore, households who have limited or lack the financial capacity to purchase the solar PV technology. Apart from poverty there are other institutional, sociological, demographic, and economic factors hindering the uptake of solar photovoltaic technologies by society and households. Taking all these into consideration, there is an importance of assessing the perception of households when it comes to decision making regarding solar photovoltaic uptake for climate change mitigation.

1.2 Research Problem

Several studies have shown the barriers hindering similar adoption and the catalyst of world transition to low-carbon emission sources of energy. Many studies have greatly focused on determinants of renewable energy adoption focusing mainly on the first-world regions (countries) due to data availability. Very few studies have explored on the assessment of the uptake solar photovoltaic technology for climate change mitigation in Kenya and the factors impacting household adoption of solar photovoltaic decision in Kenya; most of the studies focus on biogas, its impacts on livelihoods, challenges, and history [9] (Wanjohi, Irungu, & Gicheru, 2022). Other studies based in Kenya have focused on renewable energy adoption and perceptions by the public [10] (Oluoch, Pankaj, Susaeta, &Bernabas Wolde, 2021). Additionally, a cross-country study has been carried out in three countries i.e., Uganda, Ethiopia and Kenya examining the household determinants of adoption of the solar photovoltaic using the LSS [11]. Among other studies carried out they have had a key focus on mainly the various technical aspects like physical availability and cost of renewable energy technologies. The main hurdle was and still remains to be the scarcity of data on PV solar energy technologies adoption and diffusion in rural Kenya in recent phenomena. To the researcher's knowledge the existing carried out quantitative empirical studies in the rural Kenya focusing on household solar photovoltaic uptake as climate change mitigation mechanism are few. The bigger proportion on studies carried out based on energy issues in the country mainly have focused on cook stove choices and energy mix and only very few studies conducted have wholly considered the household and societal energy demand in rural areas however, they also greatly focus on fossil fuel, biomass and green energy technologies [12-14].

In this regard, this study seeks to fill the identified gaps building upon the already existing studies. This was done using both qualitative and quantitative data analysis to investigate uptake of solar photovoltaic by households, following the study was the analysis of the underlying determinants of the uptake of solar photovoltaic by households and offer great inputs on informed policy formulation and implementation; this will consequently speed up the transition of households' adoption of clean and renewable energy. To effectively achieve the study objectives, raw data was collected from households located in the rural communities in Embu County to directly examine the institutional, economic, and socio-demographic factors on uptake of solar photovoltaic by households.

LITERATURE REVIEW

Renewable energy originates from different natural sources or processes that replenish constantly in the environment, for example solar, wind, geothermal, and hydrothermal energy [15]. These sources of energy often associated with reduction in greenhouse gas emissions and promotes carbon sequestration [16]. Therefore, a considerable rise in the use of renewable energies is a significant step in mitigating climate change in economic, sociological and health sectors leading to alternative sources of income, better education status, improved health, time savings, promotion of social capital and local job opportunities [17].

Renewable energy has a high potential of providing and covering domestic energy requirements without polluting the environment [18]. Due to the high energy demand globally, there is a need to adopt renewable energy and replace conventional fuels as they contribute to different environmental challenges like greenhouse gas emissions, energy security and climate change [19]. Many households especially in the rural areas have minimal knowledge on the importance of renewable energy to the environment even when most of these households have adopted different renewable sources of energy like solar panels, solar lighting, and solar lambs [20].

Climate change impacts are now felt globally with some effects include increased temperatures, reduced rainfall, and loss of biodiversity [21]. The scientists' earlier predictions are being observed including loss of sea ice, more intense heat waves, and increased sea level rise [22]. Mostly greenhouse gases result from unsustainable human activities contributing to the climatic changes being felt in the world today. The extent to which climate change affects any region varies over a long period and the potential of different ecosystems and social systems to adapt or mitigate to climate changes. If we fail to act on climate change now, then at a global level we will continue to experience more intense and unpredictable climate change impacts which is unfavorable for both flora and fauna.

According to [23] the special report on the 1.5-degree earth warming indicates that climate change actions are needed urgently as the global emissions will be at a peak by 2030 and reduce rapidly by 2050 to net-zero if we stay within the Paris Agreement established safe limits. Climate change affects all economic and natural systems, therefore, there is a need to monitor how we interact with the environment like deforestation, waste management, greenhouse gas emissions, wetlands, and use of non-renewable sources of energy. The world has come together to work towards a common climate goal including setting up policies, environmental bodies and agreements which focus on reducing climate change.

The Concept of Solar Photovoltaic

Solar photovoltaic technologies work through creation of electricity, subsequently utilized to meet different households and businesses energy needs, whereas solar thermal technology are directly used to heat water or air. Solar technologies are important in the national and international efforts to reduce greenhouse gas emissions and achieve the ambitious climate goals. Solar energy contributes to reliability and resilience of the electric grid making the county and country energy secure in the era of increased natural disasters which are now more evident and frequent resulting from climate change. Among the solar technologies include solar panels that are great at offsetting the carbon dioxide emissions through displacing and replacing the current and future fossil fueled electricity sources as solar panels have a technical potential of 1,500–50,000 EJ per year [24].

Studies by [25] the state policy effectives that had been applied in the United States to increase solar photovoltaic capacity by households. From the carried-out study there was an undeniable positive relationship between solar photovoltaic demand and financial incentives that resulted into a reduction of the up-front cost of solar photovoltaic uptake, solar-specific mandates, and pro-environmental preferences. However, the context is entirely different in the least developing or the developing countries as the provided financial incentives aimed at reducing the actual costs of solar photovoltaic is assumed to have a crucial mandate in determining the household and societal behavior. The reason is due to the fact that the costs directly associated to solar photovoltaic remains a crucial factor that hinders the larger diffusion and uptake of the solar photovoltaic technology [12].

Factors Affecting Mitigation Measures Towards Climate Change

Mitigation actions at both the household and societal level are crucial for their significant reduction to greenhouse gases emissions and are greatly driven by the occurring climate changes [26]. There are several measures affecting the mitigation actions against climate change. The level of knowledge and financial status influences the extent to which the community takes climate actions. The educational level and age also affect the level of response [11].

People with higher environmental and climate change awareness influence people to make better decisions affecting climate change. They are willing to purchase green products and adaptive measures that reduce emissions and promote sustainable growth and agriculture, [27]. Knowledge impacts people in various ways. It influences individual concerns and will to take action or accept climate policies [28]. Financial self-efficacy in any households increases their confidence to execute the different measures put in place relating to climate change, despite their objective level of financial resources, these amongst other socio-demographic characteristics are important in assessing adoption green technologies as well as climate related matters [11].

Solar Photovoltaic Energy in Climate Change Mitigation and Adaptation

Renewable energy has a huge potential in households, especially solar photovoltaic to enhance adaption and mitigation against climate change [29]. Gradual use of solar photovoltaic will help in curbing greenhouse gas emissions and further increase carbon sequestration. The accrued benefits of climate mitigation and adaptation from solar photovoltaic through reduced carbon emissions cuts across international, national, and local levels.

Solar photovoltaic is a clean and renewable source of energy as it directly absorbs the sun’s rays and converts it into usable energy. Compared to fossil fuels, it helps reduce the carbon footprint and helps in reducing the overreliance of fossil fuels like coal and petroleum products. When generating energy using solar photovoltaic greenhouse gas emissions drastically reduce, especially carbon dioxide which eventually helps curb global warming which impacts climate change. By the uptake of solar photovoltaic at national, international, and local level it helps mitigate against climate change and promote a healthy and sustainable environment.

Climate Change Adaptation Strategy

Adaptation in climate changes implies the different sociological, ecological and economic system adjustments put in place by a community or the society in response to expected or actual climatic stimuli and their related impacts or effects [30]. Due to climate change impacts in the world including increased temperatures there is an increased need to curb the use of greenhouse gases emitting products and focus on green alternatives. Uptake of solar photovoltaic helps in curbing the release of greenhouse gases as well as other sources of renewable energy like wind and hydro power. Overreliance on fossil fuels has been a great contributing factor to climate change. Adopting renewable energy will reduce the demand of fossil fuels and eventually help in climate change adaptation.

Justification of the study

There are studies carried out focusing on factors influencing decision making of households uptake of solar photovoltaic, peer influence among households, uptake of renewable energy and the economic determinants of households on uptake of solar photovoltaic [11,31,32]. However, micro household analysis of the uptake of solar photovoltaic technology for climate change mitigation is still under researched and this study seeks to fill that gap.

2. Material and Methodology

2.1 Study area

Embu is one of is Kenya's Economically productive counties covering an area of 17,500 ha at 0° 06′ N – 0° 04′ S/33° 58′ – 34° 13′ E (Figure 1). The areas experiences a bi-modal pattern of rainfall with long rains between March and May and short rains between October and November. Temperatures range from a minimum of 12°C in July to a maximum of 21.6°C in March [33-34]. The residents depend in Rainfed agricultures, whose productivity is highly dependent on the climate and weather patterns [9]. Embu was ideal for the research as it has a mixture of different energy sources used by the respondents and therefore would give a clear impression on reason where certain respondents up took solar energy and others did not. The area is among the counties with high electricity coverage as reported and also experiences low sunshine hours approximately, per day as most of the days are covered by clouds [34].

Map 1 :

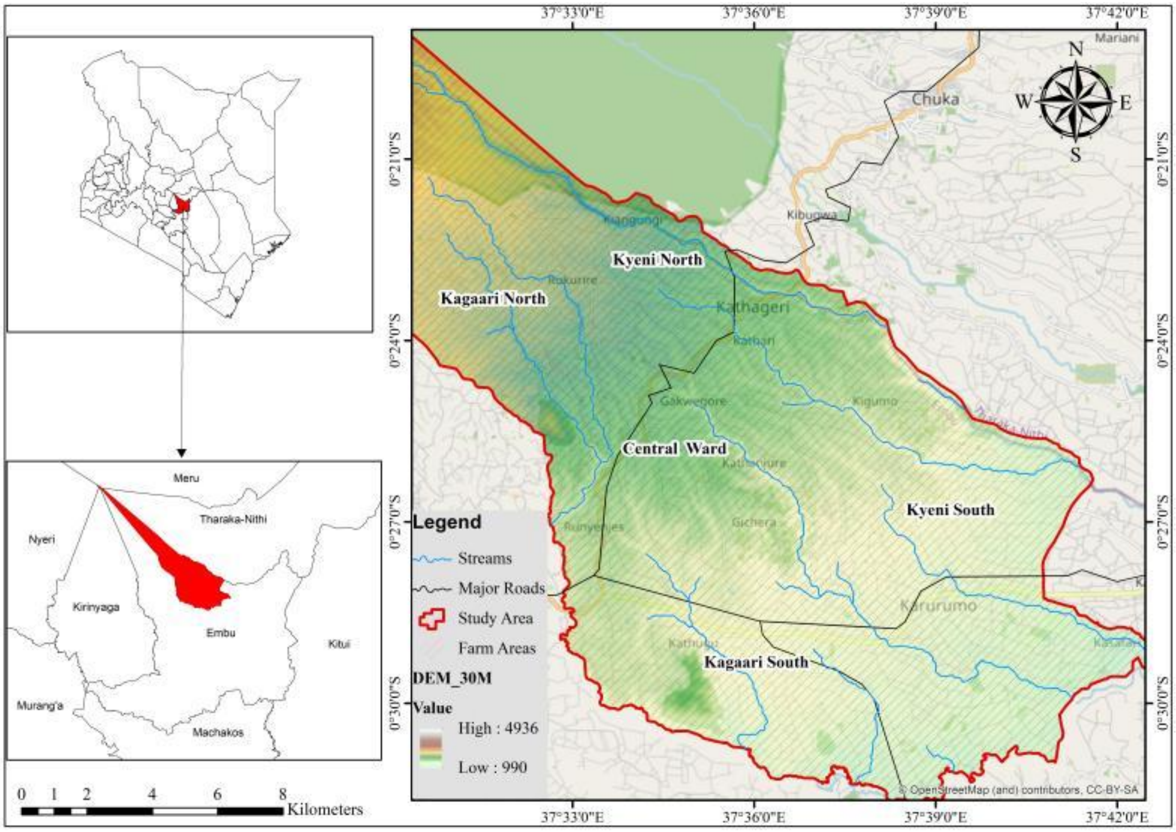


Fig. 1. Map showing study location

2.2 Research design

The study used a mixed-methods approach comparing climate data with data on perceptions of solar energy as an adaptation practices from the local community of Embu. The statistical data on rainfall and temperature were obtained from the Kenya Meteorological Department for the period 1989–2020. The climate data consisted of monthly minimum and maximum temperature and rainfall data. Though questioners, respondents were examined on their perceptions of solar energy were collected through semi structured questioners administered through a series of workshops and household visits with local residents. Purposive sampling was used to select the participants (395) that included community members, resource managers and local government officials. During the household visits, the participants filled out a questionnaire divided into four main parts, with part collecting particular type of data

1. Perception on Climate Variability (Temperature and Precipitation trends)
2. Solar energy uses in Households
3. Awareness about solar photovoltaic technology in climate change mitigation
4. Social-economic determinants of solar photovoltaic uptake by households in climate change mitigation

2.3 Data analysis

2.3.1 Trend analysis.

The excel table function was used to group and arrange temperature and rainfall data into monthly averages. The monthly data were then imported into SPSS version 20 for analysis. SPSS Man Kendell Tau Analysis was used to define the trends in rainfall and temperature over the period. A linear regression was conducted to determine temporal trends in annual rainfall over the long rains (March–May, MAM) and over the short rains (October–December, OND), and the R^2 value was used to determine whether or not the trends were significant.

2.3.4 Community Perceptions of Solar Photovoltaic Technology

Multi-variate analysis of variance (MANOVA) was used to determine how different respondent groups (by age, education level, gender and length of stay) in the study area influenced uptake of solar energy in there households. Respondents were asked to indicate there awareness of solar energy as a clean energy source and if it was a strategy to combat climate change. Chi-square tests were used to analyses how gender, age, education level and livelihood activity influenced perceptions and knowledge solar photovoltaic technology as a climate change mitigation strategy.

3.0 RESULTS AND DISCUSSION

3.1 Climate Variation (Rainfall and Temperature)

Rainfall Variation

From analysis in table 1 and in figure 2, Kendall's tau value of -0.059 suggests a moderate negative correlation between the variables (rainfall in 40-year period) under consideration, an implication of decreasing rainfalls however, the trend is nonlinear. The magnitude of -0.059 indicates the strength of the negative correlation. Similarly, an estimation of slope to determine the linear trend the 40-year period (-2.234) suggests a downward trend in the rainfall data over the 40-year period. The results suggests that, on average, rainfall has been decreasing over time during this period. However, the interpretation assumes the validity of the statistical analysis and the representativeness of the data. As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

Figure 1Rainval Variation in Embu 1980-2020

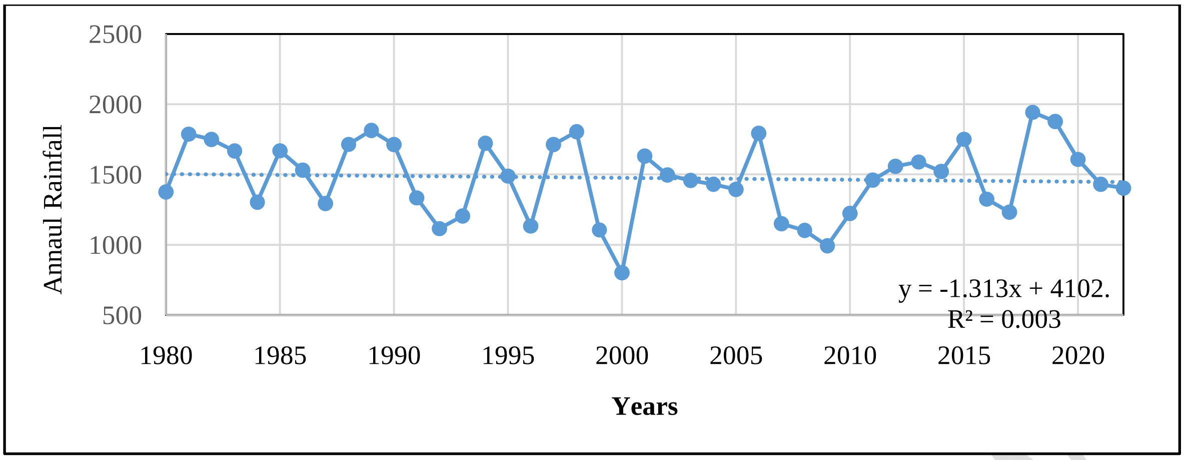


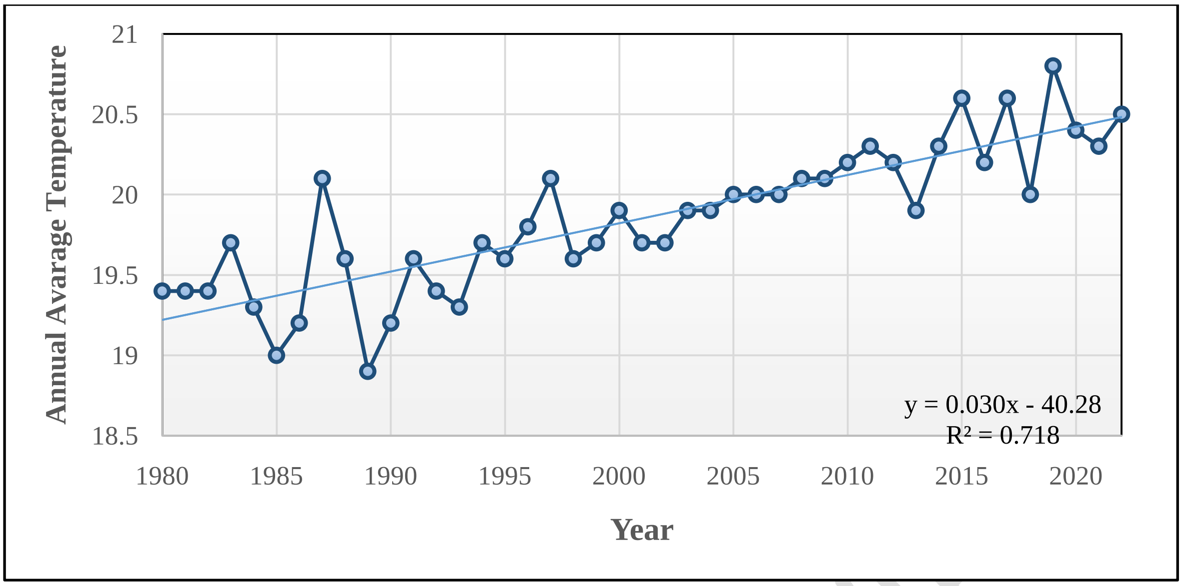
Table 1: Man Kendall's Trend Analysis of Rainfall and Temperature variation, 1980-2022

Climate Variation	Kendall's tau	S	Variable (s)	P-value	Sens Slope	Lower bound (95%)	Upper bound (95%)
Temperature	0.713	626	9060	**<0.0001**	0.03	0.025	0.037
Rainfall	-0.059	-53	9128.333	0.586	-2.433	-9.126	5.200

3.2 Temperatures Variation, 1980-2022

From the annual temperatures computed from Meteorological department, Kendall's Tau (τ) Value (0.713 indicates a relatively strong positive correlation between the temperatures and years under study over the 40-year period. Additionally, a Sen's Slope Value of 0.03 suggests a positive trend in the data over the 40-year period implying an overall increase in temperatures. The slope value represents the average change in the dependent variable, temperatures (y-axis) per unit change in the independent variable, years (x-axis). Therefore, a slope of 0.03 indicates a positive and significant increase in the variable being analyzed over the 40-year period. As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis H0, and accept the alternative hypothesis Ha.

Figure 2 Temperature Variation in Embu 1980-2020



Determining the trends in temperature and precipitation over the last 40 years in Embu County is significant for several reasons when considering the adoption of solar technology. Understanding the historical climate data, helps in assessing the solar energy potential in Embu County. Solar energy generation relies on sunlight, and by analyzing long-term weather patterns, one can estimate the availability and intensity of sunlight in the region which then would influence policies and need for uptake of solar technology. Higher levels of sunlight and lower cloud cover indicate a greater potential for solar energy generation. Evidence of increasing temperatures and shifts in precipitation patterns as presented in figure 2 and 3, clearly points to climate change in the region calling for adopting sustainable energy alternatives like solar power.

3.3 Factors Influencing Uptake of Solar

The research focused on the socioeconomic determinants that influenced adoption of solar energy among households in Embu County by assessing the characteristic of the respondents who indicated they had solar items in their homes against those who did not.

The chi-square value was 29.441, at *p value = 0.014*, confirms the presence of a significant relationship between the dependent variable and the independent variables included in the final model.

Table 2: Model Fitting Information

	Model Fitting Criteria	**Likelihood Ratio Tests**		
Model	**-2 Log Likelihood**	**Chi-Square**	**df**	**Sig.**
Intercept Only	282.265			
Final	252.824	29.441	15	.014

Table 3: Good ness of fit

	Model Fitting Criteria	Likelihood Ratio Tests		
Solar Uptake	**-2 Log Likelihood of Reduced Model**	**Chi-Square**	**df**	**Sig.**
Intercept	252.824[a]	.000	0	.
Gender	255.184	2.361	1	.124
Age	261.026	8.202	3	.042
Education	257.732	4.908	3	.179
Marital Status	255.082	2.258	2	.323
Religion	256.632	3.808	2	.149
Household head	260.341	7.517	2	.023
Source Income	254.671	1.847	2	.397

All social economic characteristic included in the analysis exhibited positive and statistically significant effects on the uptake of solar energy at homes. However, among these variables, sources of income demonstrated a greater influence compared to other factors in determining the decision to adopt solar appliances at *P* =0.397. On the other hand, factors such as age and household head showed relatively smaller effects on the likelihood of purchasing solar equipment with a p-value of 0.042 and 0.023 respectively.

The findings suggest that sources of income play a crucial role in influencing the adoption of solar energy technologies. Individuals or households with higher incomes or more diverse sources of income may have greater financial resources and flexibility to invest in solar appliances. This highlights the significance of economic factors in shaping the decision-making process related to solar energy adoption, the results compares with [35].

In contrast, variables like age and household head, while still contributing to the overall model, exhibited comparatively smaller effects on the decision to purchase solar appliances. This implies that other factors, such as financial considerations or in education, or gender, may have a more substantial impact on the adoption of solar energy technologies than age or the position of the household head.

Table 4 Multinomial Statistic

Solar Uptake[a]		B	Std. Error	Wald	Sig.	Exp(B)
Yes	Intercept	17.247	9556.56	.000	.999	
	Male	.358	.232	2.368	.124	1.430
	Female	0[b]	.	.	.	.
	18-25	17.601	1.529	132.45	.000	4.4078
	26-44	17.760	1.498	140.64	.000	5.163
	45-59	17.728	1.517	136.57	.000	5.003
	Above 60	0[b]	.	.	.	.

Primary	-18.571	.364	2595.82	.000	1.608
Secondary	-18.432	.349	2790.16	.000	9.891
Tertiary	-18.342	.000	.	.	9.082
None	0^b	.	.	.	.
Single	-.418	1.316	.101	.751	.658
Married	-.050	1.321	.001	.970	.951
Other	0^b	.	.	.	.
Christian	-18.367	9556.564	.000	.998	1.055
Muslim	-19.842	9556.564	.000	.998	2.414
Other	0^b	.	.	.	.
Farming	.276	.383	.521	.470	1.318
Business	-.029	.385	.006	.940	.971
Employment	0^b	.	.	.	.
Father	1.109	1.136	.953	.329	3.030
Mother	1.668	1.127	2.190	.139	5.303
Other	0^b	.	.	.	.

a. The reference category is: No.

b. This parameter is set to zero because it is redundant.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Under Education category, primary, secondary had a significant impact on the uptake and utilization of solar energy. An addition of one unit odd ration/probability to use solar energy compare to not using was more by 9.891 times. The odds ratio of respondents who had tertiary education was likely to increase their uptake. Notably, households lead by mothers were 5.303 more likely you adopt solar power compared to those head by fathers. This would because women interacted more with solar energy sources compared to the male counterparts. Similarly, the age of household heads was a significant and positively affect solar PV uptake in the current study. This implies that the adoption of solar PV in the Embu case is was influenced by age. These results aligns with other two previous studies indicated that age was a significant factors pointing out that younger people are more willing to pay for renewable energy because of higher awareness of the environmental benefits it does provide [35-36] Contrarily, another study in Kenya concluded that older household heads were wealthier and could easily access productive resources (e.g., land) therefore more likely adopt and invest in renewable energy technologies [37].

The results compares with the results of [38] that concluded that household head, gender, level of income (occupation) were positively influenced adoption of solar energy this were also supported by, [11,37,39,11]. Similarly, results on education compares with those of (Lay et al., 2013) indicted that education had low influence on adoption of solar despites other studies associating higher education with more knowledge on climate change therefore likelihood of adopting the renewable energy, [11, 37].

3.4 Awareness about solar photovoltaic energy for climate change mitigation and adaptation

Table 5: Climate awareness and Sources of Climate Information

Climate Awareness	Community Education		Friends		Schools		Social Media		Mass Media		Self-Education	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Strongly Disagree	16	21.1	17	22.4	15	19.7	30	39.5	33	43.4	26	34.2
Disagree	34	23.4	28	19.3	48	33.1	56	38.6	60	41.4	57	39.3
Neutral	44	37.3	31	26.3	45	38.1	58	49.2	42	35.6	22	18.6
Agree	18	36.7	23	46.9	23	46.9	25	51	21	42.9	18	36.7
Strongly Agree	0	0	3	60	3	60	5	100	2	40	0	0
Total	**112**	**28.5**	**102**	**26**	**134**	**34.1**	**174**	**44.3**	**158**	**40.2**	**123**	**31.3**
P-Value	-0.009		-0.178		-0.201		-0.129		0.026		0.082	
df	16		8		8		12		8		12	
x^2	39.765		22.193		23.961		19.12		3.357		22.928	

Across various sources, it is evident that both social media and mass media play significant roles as primary channels for disseminating climate-related information. In a study conducted by [40] participants identified these media platforms as their predominant sources of climate information.

However, when the data was subjected to quadrant analysis, respondents positioned in the 3rd and 4th quadrants, particularly those who expressed agreement or strong agreement that solar energy was a viable climate adaptation strategy, cited school and mass media as their primary avenues for accessing climate-related information. Remarkably, 60% of respondents in the 3rd quadrant and a full 100% in the 4th quadrant attributed their climate information to these two sources.

Those situated in the 1st and 2nd quadrants, comprising individuals who disagreed or strongly disagreed that solar energy was a clean energy solution, leaned more towards social media and mass media as their preferred sources for climate information. Regardless of their stance on solar energy, respondents consistently highlighted social media as a predominant information source across these divergent perspectives.

While social media retains its status as a main source of climate information, the differentiation occurs in the usage of mass media and school-based channels. The former being the more prevalent choice among those critical of solar energy's potential as a climate adaptation strategy, while the latter is embraced by individuals who acknowledge solar energy's importance in the climate agenda.

Comparatively, this study aligns with previous research highlighting the significance of media platforms in shaping public perception and understanding of climate-related matters [40]. The variation in reliance on sources, particularly in response to differing opinions on specific strategies, emphasizes the intricate interplay between information sources, climate perceptions, and attitudes.

3.5 Climate change awareness and Solar uptake

In order to examine how climate change awareness influence respondents decision making on solar uptake, responses on climate change awareness, knowledge of solar emerge as clean energy and uptake of solar as a climate mitigation method were cross tabulated to obtain a descriptive statistics and correlated to obtain significance, as presented in table 6 and table 7

Table 6: Cross tabulation of climate change awareness and solar energy

		Climate Change Awareness		**Total**
		Yes	**No**	
Solar as Clean Energy Source	Yes	266	43	309
	No	45	39	84
Total		**311**	**82**	**393**
Solar Energy as a Climate Change mitigation	Yes	201	48	249
	No	111	31	142
Total		**311**	**80**	**391**

Table 7: Correlation between climate change awareness and Perception of Solar Energy

		Climate Change Awareness	**Solar as Clean Energy Source**	**Solar as a Climate Change mitigation**
Climate Change Awareness	Pearson Correlation	1	.354**	.140**
	Sig. (2-tailed)		.000	.006
	N	394	393	390
Solar as Clean Energy Source	Pearson Correlation	.354**	1	.178**
	Sig. (2-tailed)	.000		.000

	N	393	394	391
Solar as a Climate Change mitigation	Pearson Correlation	.140**	.178**	1
	Sig. (2-tailed)	.006	.000	
	N	390	391	391

**. Correlation is significant at the 0.01 level (2-tailed).

There is significant correlation between respondents who displayed awareness of climate change and its impacts and the adoption of solar energy and awareness on solar energy adoption as a solution to climate change at p values of 0.348 and 0.140. However, despite the positive correlation, in both the variables, climate change knowledge had more influence in solar uptake than awareness of solar energy as a green energy.

Among the respondents, a small percentage (1.3%) demonstrated a high level of awareness regarding climate change and actively engaged in efforts to address its impact. These individuals, who understood the urgency and severity of climate change, were more inclined to adopt solar energy solutions. Their awareness likely stemmed from being well-informed about the environmental benefits of solar power, such as its ability to reduce carbon emissions, mitigate climate change, and promote clean energy generation.

In addition, the survey identified a group comprising 12.5% of respondents with a moderate level of awareness about climate change and its impact. While not as actively engaged as the highly aware group, this segment still possessed a reasonable understanding of the issue. Consequently, they were more likely to consider solar energy as a viable option for reducing their environmental footprint and contributing to sustainability efforts.

This finding suggests that individuals who are knowledgeable about climate change are more likely to embrace and utilize solar energy as a renewable and sustainable alternative. The connection between climate awareness and the uptake of solar energy can be attributed to several factors. First, an informed understanding of climate change prompts individuals to seek environmentally friendly alternatives to traditional energy sources. Solar energy, with its renewable and clean nature, aligns well with the goal of reducing greenhouse gas emissions and combating climate change.

Conclusion

Climate change is a global concerns. In Embu, there is evidenced variation from the long term mean for both for Precipitation and temperature. However, the efforts to combat it requires efforts from the grassroots. Adopting solar energy is a crucial strategy for mitigating the climate crisis. Embu, lies along the equator therefore has capacity to tap into solar power and utilized it in domestic chores

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