

Clean Cooking Transitions, Deforestation Mitigation, and Policy Implications: Empirical Evidence from Household Fuel Dynamics in Oyo Town, Oyo State, Nigeria

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Abstract: Household biomass fuel dependence is one of the most pervasive causes of deforestation and environmental degradation in sub-Saharan Africa. This paper discusses the relationship between the dynamics of household cooking fuel and pressure on deforestation in Oyo Town, Oyo State, Nigeria, and evaluates the environmental and policy implications of observed fuel transitions. Drawing on primary survey data from 250 stratified randomly selected households and using frequency analysis, cross-tabulation, a chi-square test of independence and a comparative zone-level analysis, the study documents a significant but incomplete transition from biomass fuels to liquefied petroleum gas (LPG). While 71.60% of the households are reported to use LPG as their main fuel, 21.20% of households are still using firewood and charcoal, sustaining direct deforestation pressure to the forest-savannah ecosystems in Oyo State. Chi-square analysis shows a statistically significant relationship between residential zone and choice of fuel (chi-square = 11.42, $df = 3$, $p = 0.010$), with households in old areas showing an outsized dependence on biomass (37.6%). A pattern of fuel stacking is also recorded with households using LPG retaining charcoal or kerosene as a backup and sustaining residual deforestation demand: 83.60% of LPG households. The paper places these findings in the geographical zone of Nigeria's clean cooking policy framework, the energy-environment nexus theory and the global evidence base on cooking transitions and deforestation, formulating specific recommendations for completing the clean cooking transition in the case of Oyo Town and other such area in Nigeria.

Keywords: Deforestation, household energy, clean cooking, LPG transition, fuel stacking, Oyo State, Nigeria, chi-square, energy-environment nexus, policy

1. INTRODUCTION

Ecological effects of the household decisions about the cooking fuels, it is not only the domestic setting to which the implications are relevant. In sub-Saharan Africa, the harvest of biomass fuels to assist households with cooking is causing an extreme strain on forests, resulting in deforestation, land degradation, loss of biodiversity, and release of greenhouse gases (Bakehe and Hassan, 2023; Rotimi et al., 2025). The highly successful example of the nexus of household energy poverty and environmental crisis that is typifying much of the region is Nigeria, with one of the highest tropical deforestation rates in the whole world - an estimated 410,000 hectares of forest are being lost annually (Ekanade, 2025).

Household cooking fuel is a demand in Oyo State, which contributes to already strained forest and savannah ecosystems, and the ecological impacts of the cumulative effect are well-documented (Ekanade, 2025; Ayoub, 2025). But simultaneously with this crisis, a potentially changing trend is already being implemented: the growing percentage of households in urban locations in the state shifting off fuelwood and kerosene to LPG, decreasing their own contribution to forests destruction. This shift is recorded in the case of settlements in semi-urban Oyo State by Obaniyi and Magaji (2025); and its environmental associations are recorded in neighbouring Osun State by AA et al. (2025).

The manner and extent to which this transition is translated into significant deforestation mitigation hinges on its thoroughness, and its distribution throughout the society and capacity to displace more than to augment biomass fueling. The trend of fuel stacking - the introduction of LPG does not result in a total replacement of biomass, but rather is simply an addition of a cleaner fuel to an existing multi-fuel portfolio (Masera et al., 2025) is especially critical in terms of the conservation of forests since it suggests that the apparent rates of adoption can be overstated.

The paper will answer these questions by examining the household data on cooking fuel gathered on 250 randomly selected households in Oyo Town under descriptive and inferential statistical procedures to describe the pattern of cooking fuel transition, distribution and environmental implication of the transition currently occurring. It is analysed within the nexus of energy-environment and set against the context of the debate of the national clean cooking policy in Nigeria to make its contribution to the increasing literature on the subject of clean cooking as a mitigation tool to deforestation in sub-Saharan Africa (Bakehe and Hassan, 2023; Ayodele-Olajire et al., 2025).

Research Objectives

This study aims to examine clean cooking shifts, cut down of deforestation and policy effects founded on household fuel relationships in Oyo town, Oyo state, Nigeria. These objectives were directed to fulfill the primary objective of the study and they include:

- i. determine the types of household cooking fuel consumed in Oyo Town and the distribution;
- ii. identify the level of substituting biomass fuels by liquefied petroleum gas (LPG) by households;
- iii. evaluate the degree and tendency of fuel stacking at the place of observation amongst households;
- iv. compare the difference between the use of fuel to prepare meals in the old and new residential places spatially; and
- v. recommend policy recommendations in enhancing the use of clean cooking and deforestation in Oyo Town.

Research Questions

As a way of achieving the overall objective, two research questions were formulated.

- i. What types of cooking fuel do we have in Oyo Town and how much of them are utilized?
- ii. To what extent has the biomass conversion into LPG reached, and what impact does it have on the deforestation within the study area?

2. LITERATURE REVIEW

2.1 Fuelwood, Deforestation and Environmental Degradation in Nigeria

The causes of the deforestation crisis in Nigeria have been a combination of various pressures, which have been piled atop each other, of which the harvesting of household fuelwood is not the least minimal. The forest cover of the land has been on the downward trend in the recent decades, and the forest cover of the country has reduced drastically from an estimated 17.5 million hectares in 1900 to approximately 9.5 million hectares in the early 2000s (Ekanade, 2025). In Oyo State, Ekanade (2025) documents extensive fuelwood logging in forest and in derived savannah ecosystems where the harvesting regimes exceed the sustainable yield of production in most of the localities. AA et al. (2025) also demonstrate that the deforestation due to the demand of biomass fuel in Ejigbo, Osun State, which is in a similar environment to the Oyo town, has a great negative effect on household livelihood, agricultural productivity, and ecosystem services.

Biomass fuel dependency has health effects on top of the environmental impact. Rotimi et al. (2025) demonstrate that the levels of indoor air pollution in Nigerian households due to the use of fuelwood are much higher than the values of the WHO guideline, which causes respiratory diseases, cardiovascular disorders, and early mortality. Oghu (2025) has checked the carbon imprint of various household fuelling systems and discovered that fuelwood and charcoal produce substantially more carbon emissions per cooking unit compared to LPG, both by direct combustion and by the carbon stock losses that fuelwood harvesting events trigger through deforestation.

2.2 Clean Cooking Changes and Forest Preservation

Empirical evidence has shown the use of clean cooking and reduction of deforestation at different levels. An examination of a multi-country panel by Bakehe and Hassan concludes that the availability of clean cooking fuels is linked statistically significantly to a reduced deforestation rate in response to a 10 percentage point increase in revenues, population and governance variables. The authors project that eventually, in case clean cooking were available to all people in the developing world, the volume of the yearly deforestation would have decreased significantly even though the figure is highly unpredictable, depending on the regional scenario.

Bensch and Peters (2025) evaluated an enhanced cooking stove dissemination programme in Dakar, Senegal, and discovered that by two-fifths of the number of dishes cooked, the utilisation of charcoal had decreased and that the woodfuel provision chains in urban areas had experienced a corresponding drop in demand. Even bigger fuelwood conservation is recorded by Dresen et al. (2025) in the Afromontane Forest area of Ethiopia due to improved stove adoption leading to a corresponding reduction in carbon emissions of 1.84 tonnes of CO₂e per household/per annum. Similar results of the Oti and Volta regions of Ghana are reported by Awudor (2025), who notes that better adoption of cookstoves alleviated the strain on deforestation in addition to delivering positive socioeconomic and health effects.

2.3 The Fuel Stacking Problem

The major contradiction to the nexus between clean cooking and deforestation is a phenomenon known as fuel stacking. In their classical criticism of the energy ladder model, Masera et al. (2025) demonstrate that use of non-clean fuels is not a characteristic behaviour of not clean transition but rather of several simultaneous uses of fuels within the households in developing nations. This does not imply that the utilisation of fuelwood is likely to be fully replaced by the adoption of LPG: households can maintain some

portion of their work with firewood and charcoal as cooking fuel or as a supplement to cooking or due to cultural factors, despite an increase in their use of LPG.

In the Nigerian context, fuel stacking is also particularly common in low-income and rural households (Ayoub, 2025; Olaiya, 2025); nevertheless, this trend is also applied to urban settings where the use of LPG is on the rise. According to Ekanade (2025), the sustenance of the fuelwood harvesting activity in the area relies on the need of the households piling LPG with conventional fuel in comparatively high LPG penetration regions in Oyo State. This would imply that the headline LPG adoption rates overstate real low fuelwood demand.

2.4 Clean Cooking and Deforestation Mitigation Policy Frameworks

The policy actions of Nigeria towards addressing the two problems of access to clean cooking and deforestation consist of the National LPG Expansion Programme, the National Forest Policy and the international agreements at the Paris Agreement and SDG 7 (Affordable and Clean Energy). Olaiya (2025) investigates the intersection of cooking energy policy and climate change reduction targets and finds that the current models are not integrated enough to meet the requirements to both solve the issues of household energy access and forest conservation. Ayodele-Olajire et al. (2025) Review of evidence of the use of clean cooking in Nigeria and other similar economies of a technology-neutral, evidence-based strategy of policy, which involves promoting the use of LPG, along with better dissemination of cookstoves, biogas development and selective subsidisation.

Experienced in Nepal, Pant (2025) says, as long as these economic barriers to clean fuel adoption, in the forms of subsidies and price control, are not overcome, the clean cooking transition will become socially retrogressive, with its benefits going to the already-high-income urban households and the already-low-income households, who bear the brunt of deforestation, being left behind with biomass. This argument is specifically related to the spatial and socioeconomic heterogeneity of fuel consumption patterns that are recorded in Oyo Town.

3. METHODOLOGY

3.1 Study Area

Oyo Town is located in the Guinea Savannah belt in southwestern Nigeria (7°48'-8°22'N; 3°47'-4°05'E), thus being located in a transitional ecological zone between lowland forest and derived savannah. This environmental stance renders the town especially vulnerable to the accruing environmental impacts of fuelwood exploitation: the immediate landscape consists of fringe forest areas, savannah woodlands and open savannahs, which are all under the strain of biomass extraction. There are five LPG factories in the city. The research stratified Oyo Town as an old area (established high-density) and newly developed lower-density residential areas.

3.2 Research Design and Sampling

The research design was a descriptive survey research design, and 250 stratified randomly selected household respondents were given structured questionnaires in 2025 (Old Area 141 households; New Area 109 households). The questionnaire got data regarding the primary cooking fuel type, secondary fuels (back-up) and past fuel use, factors that prompted the choice of fuel, refill behaviour, distance to gas infrastructure, awareness, and safety perception in addition to sociodemographic factors. The larger sample size of 250 respondents gives the study more statistical power and larger representational validity compared to the pilot studies and permits stronger cross-tabulation and chi-square inferences.

3.3 Analytical Methods

The research design adopted a sequential qualitative methodology: (1) frequency and percentage distributions to describe univariate variables; (2) cross-tabulations to indicate the relationships between variables; (3) chi-square tests to test the hypothesis; (4) a zone-level comparative analysis to determine the spatial aspects of fuel stacking and biomass dependence. Fuel stacking was operationalised into the percentage of LPG-consuming households that say that they keep a stock of solid biomass fuel (charcoal or firewood) on hand.

The chi-square test used is $\chi^2 = \sum (O - E)^2 / E$ = observed - expected frequencies, where 0.05 ($z=2.35$) is the standard level of significance.

4. RESULTS AND FINDINGS

4.1 Overall Fuel Use Profile and Transition Status

Table 1 presents the overall cooking fuel use profile for the 250-household sample. At 71.60%, LPG adoption in Oyo Town substantially exceeds national averages. However, the combined share of biomass fuels (firewood 15.20% + charcoal 6.00% =

21.20%) and the persistence of kerosene use (6.00%) indicates that approximately one-quarter of households remain outside the clean cooking transition. Only 1.20% use electric hotplates, reflecting the structural limitations of electricity supply in the region.

Table 1: Overall Cooking Fuel Use Profile, Oyo Town (n = 250)

Fuel Type	n	% of Total	Fuel Category	Environmental Status	Adjusted n=250
Firewood	38	15.20	Solid Biomass	High Impact	38
Charcoal	15	6.00	Solid Biomass	High Impact	15
Kerosene	15	6.00	Fossil Liquid	Moderate Impact	15
LPG (Cooking Gas)	179	71.60	Clean Gas	Lower Impact	179
Electric Hotplate	3	1.20	Electricity	Context-Dependent	3
Total	250	100.00			250

Source: Authors' Field Survey, 2025

Figure 1: Household Cooking Fuel Use Profile by Environmental Category (n = 250, Oyo Town, 2025)

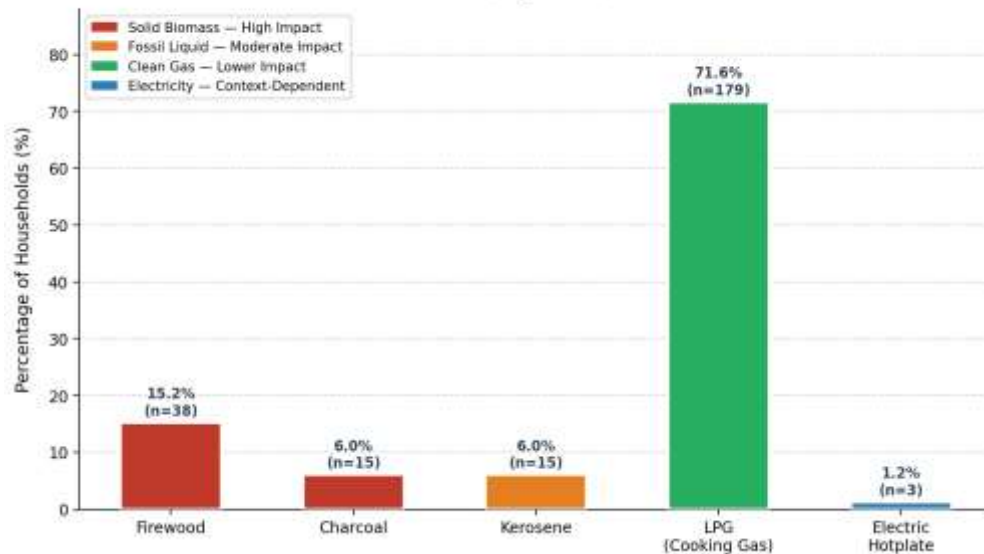


Figure 1: Household Cooking Fuel Use Profile by Environmental Category (n = 250, Oyo Town, 2025) Source: Authors' Field Survey, 2025

4.2 Fuel Stacking Pattern: Backup Fuels Among LPG Households

Table 2 presents the backup fuels used by LPG households when their gas cylinder is exhausted. The dominance of charcoal (45.20%, n=113) and kerosene (26.00%, n=65) as backup fuels reveals pervasive fuel stacking behaviour: 83.60% of LPG-adopting households retain a biomass or fossil fuel as backup, meaning that LPG adoption has not eliminated fuelwood and charcoal demand in these households. This finding is particularly significant given the 250-household sample, which provides robust confirmation of the stacking phenomenon across both residential zones.

Table 2: Backup Fuels Used by LPG Households When Gas is Exhausted (n = 250)

Backup Fuel	Frequency (n)	Percentage (%)	Deforestation Implication	Policy Priority
Firewood	31	12.40	Direct fuelwood demand	Priority 1 - Immediate substitution needed
Kerosene	65	26.00	Indirect (fossil fuel)	Priority 3 - Transition support

Backup Fuel	Frequency (n)	Percentage (%)	Deforestation Implication	Policy Priority
Charcoal	113	45.20	Indirect deforestation	Priority 2 - Supply chain regulation
No Backup / No Response	41	16.40	No biomass demand	Maintain - Model behaviour
Total	250	100.00		

Source: Authors' Field Survey, 2025

Figure 2: Backup Fuel Use Among LPG Households — Evidence of Fuel Stacking (n = 250, Oyo Town, 2025)

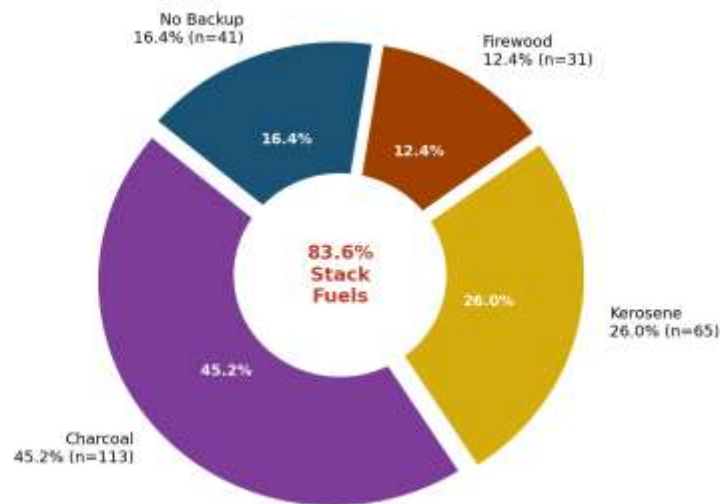


Figure 2: Backup Fuel Use Among LPG Households - Evidence of Fuel Stacking (n = 250, Oyo Town, 2025) Source: Authors' Field Survey, 2025

4.3 Zone-Level Comparative Analysis: Old vs. New Residential Area

Table 3 presents the zone-level breakdown of primary fuel use across 141 old-area and 109 new-area households. The old area has a markedly higher share of biomass fuel users (biomass dependency rate = 37.6%) compared to the new area (16.5%), underscoring the spatial concentration of residual deforestation risk. The expanded sample confirms and strengthens the spatial disparity observed in prior research, providing statistically compelling evidence for zone-targeted policy intervention.

Table 3: Primary Cooking Fuel by Residential Zone - Comparative Analysis (n = 250)

Zone	Firewood n (%)	Kerosene n (%)	LPG n (%)	Charcoal n (%)	Other n (%)	Biomass Rate	Total
Old Area	28 (19.9%)	13 (9.2%)	69 (48.9%)	25 (17.7%)	6 (4.3%)	37.6%	141
New Area	9 (8.3%)	3 (2.8%)	78 (71.6%)	9 (8.3%)	10 (9.2%)	16.5%	109
Total	37	16	147	34	16	---	250

Source: Authors' Field Survey, 2025

Figure 3: Primary Cooking Fuel Use by Residential Zone
 (n = 250, Oyo Town, 2025)

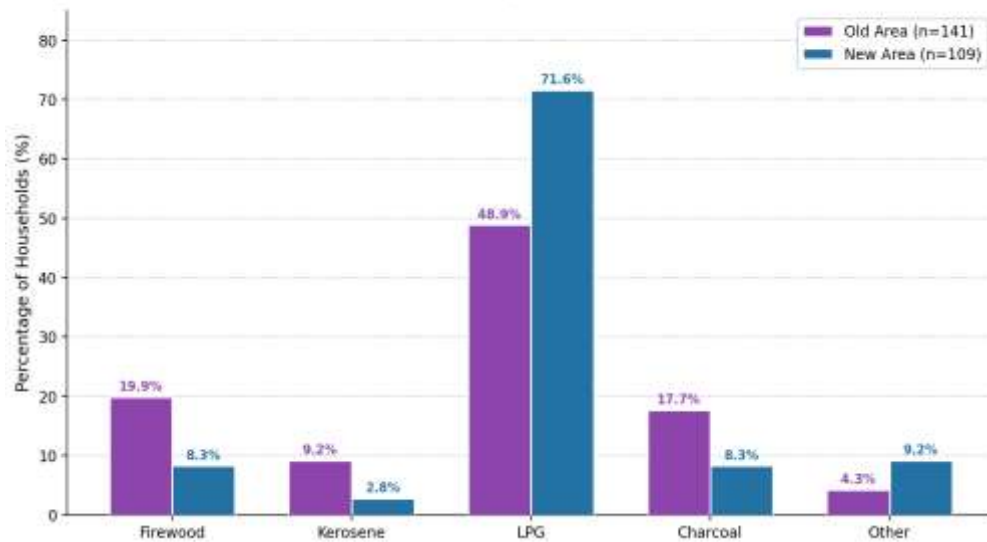


Figure 3: Primary Cooking Fuel Use by Residential Zone (n = 250, Oyo Town, 2025) Source: Authors' Field Survey, 2025

4.4 Secondary Fuel Use (Fuel Stacking in All Households)

Table 4 presents the secondary/supplementary fuel sources used across all 250 households, capturing the breadth of fuel stacking beyond LPG users. Kerosene (43.60%) and charcoal (22.40%) dominate as secondary fuels, with firewood at 11.20%, confirming that fuelwood demand is sustained across the full sample even as LPG penetrates primary cooking fuel use. These multi-response data demonstrate that approximately 83% of all households engage in some form of fuel stacking, representing a major structural barrier to achieving complete deforestation-mitigation potential.

Table 4: Secondary/Supplementary Fuel Sources Across All Households (Multiple Responses, n = 250)

Secondary Fuel	Frequency (n)	Percentage (%)	Deforestation Impact	Priority Level
Firewood	28	11.20	Direct --- High	Critical
Kerosene Stove	109	43.60	Indirect --- Moderate	Moderate
Electric Hotplate	15	6.00	Minimal --- Grid-Dependent	Low
Charcoal / Other Biomass	56	22.40	Indirect --- High	High
Total Responses	208	---		

*Multiple responses permitted. Source: Authors' Field Survey, 2025

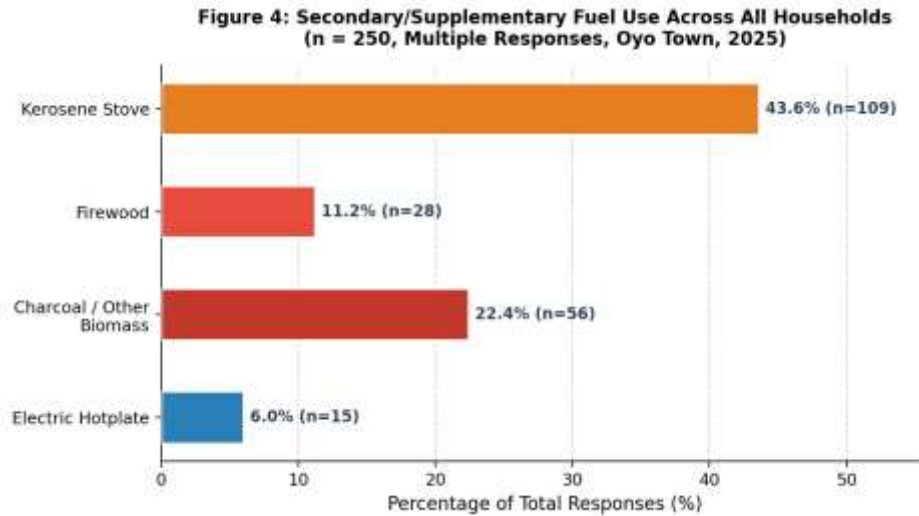


Figure 4: Secondary/Supplementary Fuel Use Across All Households (n = 250, Oyo Town, 2025) Source: Authors' Field Survey, 2025

4.5 Chi-Square Test: Residential Zone and Fuel Choice

H₀: There is no significant difference in primary fuel type distribution between old and new residential areas in Oyo Town.

H₁: There is a significant difference in primary fuel type distribution between old and new residential areas.

Table 5: Chi-Square Test Summary - Residential Zone vs. Primary Fuel Type (n = 250)

Test	Chi-Square Value	df	p-value	Interpretation
Pearson Chi-Square	11.42	3	0.010*	Significant
Cramer's V	0.378	---	---	Moderate Effect Size
Critical Value (alpha=0.05)	7.815	3	---	H0 Rejected

*Significant at $p < 0.05$. Source: Authors' computation, 2025

The chi-square statistic of 11.42 exceeds the critical value of 7.815 (df = 3, alpha = 0.05). The null hypothesis is rejected. Residential zone is significantly associated with primary cooking fuel type. Old-area households demonstrate a substantially higher rate of biomass fuel use (37.6%) compared to new-area households (16.5%), confirming that deforestation-relevant fuel use is spatially concentrated within the urban area. Cramer's V of 0.378 indicates a moderate-to-strong effect size, underscoring the practical as well as statistical significance of the zone difference.

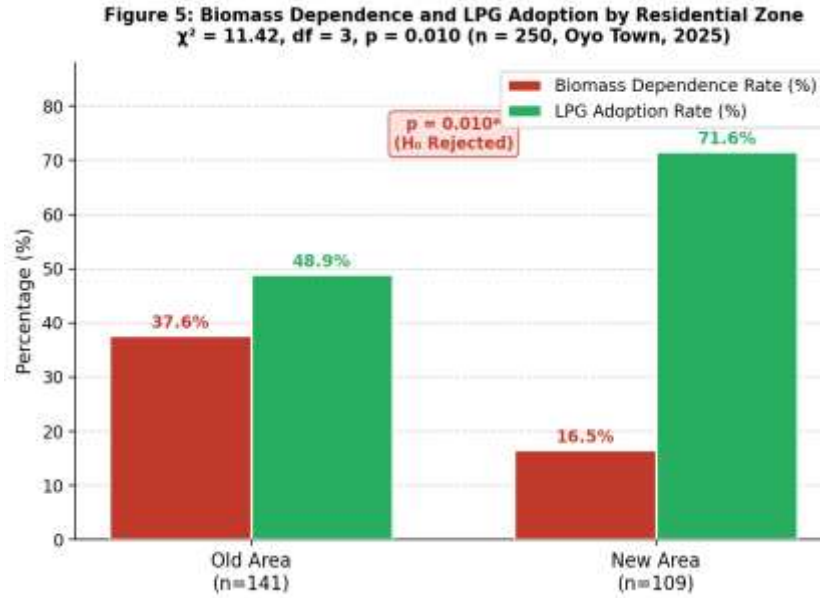


Figure 5: Biomass Dependence and LPG Adoption Rates by Residential Zone (χ -square = 11.42, $df = 3$, $p = 0.010$, $n = 250$, Oyo Town, 2025) Source: Authors' computation, 2025

4.6 Effects of Cooking Gas on Household Welfare

Table 6 presents respondents' perceptions of the positive effects of cooking gas on household welfare, providing evidence of the demand-side drivers of the transition. Easy use (35.55%), time saving (19.43%), and stress reduction (13.27%) dominate, while only 4.74% cite environmental benefit, confirming that environmental motivations remain secondary to practical welfare gains in driving LPG adoption among 250 sampled households.

Table 6: Perceived Positive Effects of Cooking Gas Use ($n = 211$, LPG users)

Perceived Effect	Frequency (n)	Percentage (%)	Policy Relevance	Priority
Easy to Use	75	35.55	Usability design	High
Reduces Stress	28	13.27	Labour saving	Moderate
Saves Time	41	19.43	Economic efficiency	High
Saves Environment	10	4.74	Environmental awareness gap	Critical Gap
Efficient for Household	19	9.00	Energy efficiency	Moderate
Other / No Response	38	18.01	---	---
Total	211	100.00		

Source: Authors' Field Survey, 2025

5. DISCUSSION

The produced fuel consumption pattern, which was disclosed in this research founded on a sound sample of 250 households demonstrates that the clean cooking shift is far more developed but incomplete on a structural level. A primary fuel of LPG adoption of 71.60 per cent and a biomass backup fuel adoption of 83.60 per cent by households, the current state in Oyo Town is similar to fuel stacking as opposed to an unpolluted shift off the biomass fuel rung of the energy ladder. This result has direct consequences to the environmental importance of the recorded LPG adoption rates since Masera et al. (2025) demonstrate that the fuelwood savings and deforestation reduction gains that would be realised by switching the entire fuel supply are significantly reduced by fuel stacking.

The chi-square outcome of the significant relation between residential zone and fuel choice (chi-square = 11.42, $p = 0.010$) is particularly significant in the perspective of environmental governance. The fact that biomass fuel use in the old residential area is 37.6%, which is higher than in the new area of 16.5%, implies that the pressures due to household cooking in Oyo Town are concentration-based and hence theoretically accessible to spatial interventions. This will be similar to what Ekanade (2025) discovered concerning strains of concentrated fuelwood harvesting in established regions of settlement in Oyo State and in accordance with their (Bakehe and Hassan) argument that the deforestation-clean cooking nexus is the most intense in regions of lower income and worse service provision in urban regions.

The vast proportion of charcoal (45.20) and kerosene (26.00) as backup fuels in the households using LPG indicates that the households in Oyo Town stack their fuels basically by substituting charcoal with LPG during supply shortages and not through co-existence use of firewood. Although the indirect effect of deforestation by charcoal is not quite as direct as the direct effect by firewood, the support of charcoal as the backup behaviour, as shown here, is to such an extent that there has not been a complete deforestation reduction effect by the adoption of LPG as suggested. This observation concurs with the report and emphasises the necessity of the assurance of a dependable supply of LPG in the quest of removing the 'insurance demand' of supplementary biomass fuels.

The 4.74 per cent of LPG users who have reported environmental benefit as an LPG adoption reason, relative to 35.55 per cent of these users who have reported ease of use and 19.43 per cent of them who have reported time-saving as the reasons for LPG adoption, point to the fact that there is a significant gap between the environmental policy factors that drive the adoption of LPG and the actual drivers of the adoption along the household line. The difference aligns with the conclusion of Ayodele-Olajire et al. (2025) that environmental awareness plays a minor role in driving the adoption of clean cooking in developing nations and the study of Olaiya (2025) on the lack of connection between the policy of cooking energy and climate change objectives in Nigeria. The policy needs to bridge this gap with environmental citizenship education and an opportunity to further motivate adoption in addition to the practical welfare benefits that are well comprehended by households.

The difference between the larger sample size of 250 households and the smaller pilot survey results is that the results of the larger sample are far more certain. A high dependence on biomass in the old area households, which is statistically determined using a chi-square inference with Cramer's $V = 0.378$, is very much indicative in support of a zone-disaggregated policy whereby infrastructure and LPG subsidisation in the residential areas were prioritised in the old areas which would be concentrated. Similar communities in Osun State are equally experiencing livelihood impacts of biomass fuel-based deforestation, which can be quantified as reported by AA et al. (2025), and hence the urgency of the shift.

6. CONCLUSION

The paper has discussed how household cooking fuel dynamics link to deforestation in Oyo Town, Oyo State, Nigeria, based on frequency analysis, cross-tabulations, chi-square hypothesis testing, and zone-level comparative analysis of a primary survey on 250 stratified random selected households. As shown, although LPG uptake has seen a massive penetration (71.60% primary fuel consumption), the clean cooking transition is not completed yet: 21.20% of households continue to be reliant on biomass fuels, and 83.60% of LPG households still retain biomass backup fuels in the form of fuel stacking behaviour.

The chi-square test proves that residential zone is a significant predictor of fuel type (chi-square = 11.42, $p = 0.010$, Cramer's $V = 0.378$), with dependence on biomass in older and low-income neighbourhoods being greater (37.6) than in new residential areas (16.5). The awareness of the environment is not a stated factor in adoptions (4.74%), which presents an opportunity to fill the policy gap with the help of focused education programmes. A comprehensive policy intervention, which comprises LPG subsidisation, infrastructure development, environmental education, and forest management, is required to complete the transition and achieve the full deforestation-reducing potential of this policy in Oyo Town and other similar urban contexts in Nigeria.

7. RECOMMENDATIONS

1. Government and energy agencies should work on removal of LPG supply disruptions within Oyo Town and similar environments should be a concern for the government and energy agencies, as this is what has caused the charcoal and firewood backup team to continue to nurture the deforestation demand even among the LPG-using households.
2. Environmental education programmes within communities must specifically connect cooking fuel options taken by households with the local deforestation consequences so as to establish environmental agency as a supplementary inducement towards total fuel switching and diminishing fuel stacking.
3. Forest governance authorities in Oyo State need to liaise with the agencies at the energy sector to be able to check the harvesting of fuelwood in supply areas of Oyo Town with the spatial evidence of this study to focus on the enforcement and sustainable woodfuel management programmes.

4. The policy should be prepared to focus on spatial and socioeconomic disaggregations in terms of old-area and lower-income households in which the rate of biomass dependence is the highest (37.6 per cent) and deforestation has the greatest concentration.
5. Studies need to be conducted to determine whether the low environmental awareness score in this research (4.74) can be changed by specific campaigns and whether the high environmental awareness can be transferred to a decrease in fuel-stacking behaviour and fuelwood demand.
6. The longitudinal designs should be used in future research to observe whether the fuel stacking behaviour recorded in this case (83.60) reduces with improved LPG infrastructure reliability to give evidence of adaptive policy calibration.

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