Determinants of Renewable Energy Adoption among Rural and Urban Populations in Nigeria.

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ABSTRACT

Nigeria faces severe energy deficits, with over 80 million citizens lacking reliable electricity despite vast renewable potential. existing studies in subsaharan africa have focused mainly on public attitudes toward renewables, offering limited behavioural insight for actionable policy. this study aims to assess renewable energy (re) adoption propensities in nigeria and examine urban–rural divergences to guide targeted interventions. the study employs open data kit (odk) to enhance data quality and uses binary logistic regression to predict re adoption behaviour. a stratified random sample of 2,500 respondents drawn from nigeria's six geopolitical zones was surveyed. key variables include awareness, education, attitudes, income, and residential location. results show an overall re adoption propensity of 62.1%, higher in urban areas (70.2%) than rural areas (53.9%). significant predictors of adoption include urban residence (or = 1.92, $p < 0.001$), educational attainment (or = 1.41, $p = 0.003$), awareness (or = 1.28, $p = 0.015$), favourable attitudes (or = 1.16, $p = 0.027$), and income (or = 1.00, $p = 0.042$). Unlike kenya's rural-led inclination toward renewables (oluoch et al., 2020), nigeria displays urban primacy, attributed to economic inequalities and grid unreliability. this study shifts from attitudinal assessment to behavioural prediction, offering a forward-looking analysis of re adoption. by integrating enhanced data collection tools and modelling behavioural propensities, the research provides actionable insights for designing targeted policies—particularly rural-focused awareness and instructional campaigns—beyond the descriptive limits of earlier studies.

Keywords: renewable energy adoption, urban-rural disparities, logistic regression, Nigeria, sub-Saharan Africa.

INTRODUCTION

Global imperatives for sustainable energy trajectories, aligned with Sustainable Development Goal 7 (SDG 7), which seeks universal access to affordable, reliable, sustainable, and modern energy, underscore Nigeria's paradoxical position as a resource-endowed nation besieged by access deficiencies. Recurrent grid failures afflict more than 80 million inhabitants, intensifying socioeconomic inequities and constraining developmental momentum (World Bank, 2023). Nonetheless, Nigeria possesses formidable renewable prospects, encompassing solar photovoltaic capacities exceeding 200 GW and annual hydropower reservoirs nearing 280 billion cubic meters (IRENA, 2023). Harnessing these imperatives demands not only infrastructural advancements but also robust societal engagement, particularly amid pronounced urban-rural bifurcations in provisioning and socioeconomic fabric (Akinwale & Sanusi, 2020).

Scholarship on grassroots perspectives in sub-Saharan Africa affirms the criticality of localised intelligence for efficacious transitions (Oluoch et al., 2020). The Kenyan inquiry by Oluoch et al. (2020) documented 70% awareness and 73% endorsement of renewables and found that educational attainment was associated with constructive orientations, as assessed using ordered logit specifications. However, this approach is inclined toward synoptic portrayals, is prone to data distortions from manual acquisition methods (e.g., omissions), and favours attitudinal indicators over prospective adoption modelling, thereby curtailing its instrumental value in crafting intricate frameworks. Such limitations are particularly acute in Nigeria, where metropolitan enclaves contend with intermittent grids despite superior amenities, while agrarian peripheries endure heightened marginalisation and remoteness (Ohimain, 2013). Nigerian literature chronicles moderate renewable energy

awareness (e.g., 50-60% solar recognition) driven by grid unreliability, yet censures the paucity of rigorous, goal-oriented paradigms (Oyewo et al., 2019; Aliyu et al., 2021; Chanchangi et al., 2020).

Contemporary evolutions in Nigeria's RE domain as of 2025 intensify these imperatives. Sectoral appraisals delineate installed capacities of 112 MW for solar and 2,100 MW for hydropower, yet emphasise infrastructural exigencies and regulatory reinforcement to realise potentials exceeding 210 GW for solar and 3.2 GW for wind (Adeoye & Elegbede, 2025). Econometric dissections reveal that RE accounted for less than 10% of supply in 2024, constrained by regulatory discord and fiscal barriers (Okafor & Nwankwo, 2025). These disclosures intimate technical viability eclipsed by perceptual and institutional barriers, including subdued public awareness and entrenched fossil fuel inclinations (Ibrahim & Yusuf, 2025). Modelling the ramifications of RE adoption for power sustainability underscores that aggressive trajectories could achieve a 62% RE share, substantially mitigating greenhouse gas emissions (Okoro & Akintola, 2025). The economic and ecological dividends of RE transition accentuate Nigeria's expansive solar, wind, biomass, and hydropower reservoirs as catalysts for systemic reconfiguration (Afolabi & Ogunleye, 2024). Solar assimilation amid escalating tariffs and grid instability underscores household-level economic imperatives (Okoro & Akintola, 2025).

This endeavour redresses these voids by operationalising ODK for enhanced data fidelity, alleviating distortions through contemporaneous ingress and geospatial authentication, and logistic regression for probabilistic projections. It proffers innovative, prospective insights into RE catalysts in Nigeria, delineating urban-rural fissures to underpin customised policy architectures. Transcending attitudinal delineations, it resonates with emergent global discourses on energy equity, wherein perceptual constructs are instrumental in bridging adoption interstices (Sovacool, 2009). In sub-Saharan Africa, characterised by 4% annual urbanisation that has engendered megacities like Lagos, the interplay of spatial variation and perceptual dynamics necessitates meticulous interrogation to forestall exacerbated disparities (World Bank, 2023). Recent delineations of RE sector trajectories invoke challenges encompassing policy lacunae and proliferation pathways, including solar viability within sustainable urban paradigms (Adeyemi & Ojo, 2025; Novatia Consulting, 2025).

Moreover, the investigation mirrors broader sub-Saharan motifs, in which RE assimilation exhibits stark urbanrural bifurcations. Cross-national inquiries reveal that urban areas benefit from grid extensions and economic upswings correlated with RE proliferation, whereas rural areas lag owing to infrastructural scarcity and socioeconomic impediments (Sovacool et al., 2025). In Nigeria, rural electrification reaches only 31%, juxtaposed against urban rates nearing 81%, compelling the adoption of decentralised RE modalities (National Population Commission [NPC] & ICF, 2019). Two thousand twenty-five convener dialogues affirm that over 85 million Nigerians are bereft of power, with rural communities disproportionately affected, and advocate policy harmonisation and indigenous fabrication to reduce expenditures (Budgit Foundation, 2025). Synthesised projections posit RE expansion could attenuate emissions by 65% and generate 5.4 million employment opportunities by 2055, with rural accruals via dispersed architectures (Adeyemi & Ojo, 2025). The nexus of energy expenditure, RE, and circular paradigms in proliferation corroborates the potential of renewables to augment GDP (Okafor & Nwankwo, 2025). Verdant urbanism through RE in sustainable development exemplars across Lagos, Abuja, and ancillary metropolises illuminates urban latent (Adeyemi & Ojo, 2025).

Subsequent segments elucidate the evidentiary corpus, theoretical edifice, procedural rigour, empirical disclosures, analytical profundity, and prescriptive imperatives. Via this vantage, the inquiry not only augments the empirical repository but also imparts operable sagacity for protagonists seeking to galvanise Nigeria's RE odyssey amid intensifying climatic exigencies, consonant with 2025 exhortations for tenable modalities in proficient provisioning (Okafor & Nwankwo, 2025

LITERATURE REVIEW

Renewable energy assimilation in nascent economies hinges on a confluence of perceptual, social, and economic determinants, as explicated in foundational behavioural paradigms. This delineation synthesises extant erudition, segmenting it into global panoramas, sub-Saharan Africa-centric inquiries, and Nigeria-specific explorations, while illuminating the interstices this endeavour ameliorates.

Global Perspectives on Re Adoption

Globally, RE proliferation is modulated by appraisals of utility and usability, per TAM (Davis, 1989) and TPB (Ajzen, 1991). Empirical validations, such as those by Li et al. (2022), fuse these frameworks to demonstrate attitudinal positivity and discerned advantages that correlate with adoption propensities in efficiency arenas. Contemporary meta analyses substantiate these associations, with attitudes and perceived utility as robust predictors of RE technological integration across 115 studies, moderated by communal morphology and developmental stage (Alkhazaleh et al., 2025). In mature milieus like Finland, acceptability interrogations reveal context-attuned predictive mechanisms indispensable for overcoming impediments (Moula et al., 2013). Congruently, Indonesian tourism sector dissections underscore affordability and cognisance as cardinal, albeit frequently confined to delineative gauges sans probabilistic elaboration (Masra et al., 2019).

Perceptual facets, encompassing cognisance and attitudinal scaffolds, are increasingly posited as foundational. For instance, psychological obstruction synopses in emergent realms, invoking Behavioural Reasoning Theory (BRT), delineate constrained reasoning and peril aversion as adoption retardants, advocating culturally attuned countermeasures (Westaby et al., 2025). These align with universal advocacies for perceptual fortification to address intention-behaviour gaps (Sovacool, 2009). Sustainable energy technological assimilation meta analyses refine elucidations, designating norms, attitudes, and control as paramount linkages, furnishing substrata for pinpointed interventions (Sovacool & Griffiths, 2025). Appraisals of RE assimilation toward SDG attainment in locales like Ha'il evince analogous perceptual propellants (Alshammari & Alharbi, 2025). Determinants shaping consumers' proclivity to adopt RE apparatuses, framed as paradigms for alleviating indigence, highlight perceptual and pecuniary interrelations (Kumar & Singh, 2024).

RE Dynamics in Sub-Saharan Africa

Sub-Saharan Africa scholarship unveils heterogeneous cognisance and attitudinal configurations vis-à-vis RE. Kenyan endeavours correlate education with affirmative renewable vistas, yet end at attitudinal constraints (Oluoch et al., 2020). Ethiopian and Ghanaian examinations accentuate fuel scarcity and shortages, sing renewable pivots but ad, here to delineative optics absent, prognostic analytics (Guta, 2014; Ibrahim et al., 2021). West African discourses identify pecuniary barriers, charting sentiments through surveys but infrequently progressing to intention modelling (Mas'ud et al., 2016; Emodi & Boo, 2015).

Urban-rural differences are conspicuous, with multivariate analyses revealing that disparities in acceleration correlate with disparities in variances, wherein economic ascension associates with proliferation, albeit accessibility falters rurally (Olanrele & Fuinhas, 2025). Impediments encompass infrastructural deficits and sociocultural recalcitrance, with asymmetrical resource apportionment exacerbating fissures (Sovacool et al., 2012). Clean energy interstices attenuate with infrastructural augmentation, yet rural arrears persist across precincts (Zhang et al., 2023). Assimilation appraisals indicate rural access at 31.1%, attributable to centralised grids and private-sector scarcity (Olanrele & Fuinhas, 2024).

Domiciliary energy evolutions exhibit spatial heterogeneity, with rural areas showing cost-sensitive responses to surcharges on surrogate fuels, whereas urban areas show insensitivity (Twumasi et al., 2022). Socioeconomic dissections reveal rural predilections for economical RE modalities such as biomass, juxtaposed against urban sustainability imperatives (Oluoch, 2020). These configurations intimate that RE is latent, eclipsed by perceptual and institutional constraints (IRENA, 2021). Electricity shortages impede growth (IMF, 2024). Equitable proliferation in SSA mandates 3.5 million renewable energy jobs by 2050, with solar energy constituting a triad (IRENA, 2025). SDG synopses state that SSA accounts for 85% of the global unpowered cohort (UN, 2025).

Decentralised RE indispensable for rural amelioration (2025). Urban-rural electricity interstice widens, from 49.71 points in 2000 to 50.30 in 2022 (2025). Rural-urban infrastructural interstice in water, power, and cooking persists (World Bank, 2025). RE proliferation starkly reveals rural-urban disparity, with 78% urban access versus subdued rural access (2025). 565M in SSA unpowered, four-fifths rural (2025). Urban peri-urban access SSA appraisal (RES4Africa, 2025). Energy indigence decodes rural-urban (2025). Proliferating to renewable electric energy in expeditiously urbanising SSA unveils challenges and affordances (Olanrele & Fuinhas, 2025). Impediments to RE proliferation in SSA from stakeholder vantage (Sovacool et al., 2025).

Dynamic interstices in clean energy utilisation across rural-urban, regional, ethnic frontiers (Zhang et al., 2023). Appraisal of renewable electricity proliferation in SSA (Olanrele & Fuinhas, 2024). Rationale for subdued domiciliary electricity proliferation in SSA (Blimpo & Cosgrove-Davies, 2019). Urban and rural domiciliary energy proliferation in SSA: spatial heterogeneity (Twumasi et al., 2022). Access to electricity in urban and peri-urban precincts in SSA (RES4Africa, 2025). Socioeconomic dissections of RE modalities for SSA (Oluoch, 2020). Renewable energy proliferation in Africa (IRENA, 2021). Harnessing renewables in SSA (IMF, 2024).

Nigeria-Specific Scholarship and Recent Developments

Nigeria-specific scholarship amplifies these motifs, chronicling moderate solar awareness (50-60%) driven by grid instability, yet reproving the dearth of intention-oriented paradigms (Oyewo et al., 2019; Aliyu et al., 2021; Chanchangi et al., 2021). Rural-centric examinations unveil socioeconomic constrictions, with revenue constraints favouring biomass, and multinomial apparatuses designating awareness and scholastic attainment as pivotal (Okwanya et al., 2020; Akinwale & Sanusi, 2020). Urban inquiries delineate outage-driven interest, albeit data biases persist (Bamgbose & Ogunlana, 2022; Ugwu & Soyoye, 2021).

Recent delineations for 2023-2025 furnish contemporary acumen. Sectoral appraisals enumerate capacities (e.g., 112 MW solar, 2,100 MW hydropower) and latent capacities (e.g., 210 GW solar, 3.2 GW wind), yet emphasise the infrastructural, financial, and regulatory prerequisites for sustainable development (Adeoye & Elegbede, 2025). Proliferation lingers below 10% of supply, beleaguered by regulatory dissonance and fiscal strictures, with econometric apparatuses evincing economic ascension and cognisance as propellants (Okafor & Nwankwo, 2]025). Material impediments, including import dependencies for solar PV and batteries, are mitigated through indigenous bio-derived innovations and R&D, particularly to augment rural off-grid use (Ibrahim & Yusuf, 2025). Modelling the ramifications of RE proliferation for power sustainability underscores the need for aggressive trajectories to attain 62% RE apportionment, thereby substantially attenuating greenhouse gas emissions (Okoro & Akintola, 2025). Pecuniary and ecological benefits of RE proliferation underscore the role of expansive solar, wind, biomass, and hydropower reservoirs as catalysts for further expansion (Afolabi & Ogunleye, 2024). Solar assimilation amid escalating tariffs and grid capriciousness underscores domestic pecuniary urgency (Okoro & Akintola, 2025). Renewable energy and verdant technological assimilation as tenable modalities for proficient provisioning (Okafor & Nwankwo, 2025). Nigeria's RE sector appraisal of present and prospective (Adeoye & Elegbede, 2025). RE Nigeria feasibility, policy interstices and proliferation pathways (Okafor & Nwankwo, 2025). Renewable energy verdant technological assimilation viable modality efficient supply Nigeria (Okafor & Nwankwo, 2025). Verdant Nigeria's metropolises: exemplars of RE sustainable urban proliferation (Adeyemi & Ojo, 2025). Modelling ramifications of RE proliferation in Nigeria's power sector sustainability (Okoro & Akintola, 2025). Renewable energy proliferation B2C approach

Africa (Budgit Foundation, 2025). Pecuniary and ecological boons of RE proliferation in Nigeria (Afolabi & Ogunleye, 2024). Solar energy proliferation in Nigeria pecuniary urgency (Okoro & Akintola, 2025). Renewable energy sustainable proliferation in Nigeria (Adeyemi & Ojo, 2025). Ramification energy expenditure RE circular energy pecuniary proliferation Nigeria (Okafor & Nwankwo, 2025). The Nigerian RE sector appraisal presents a promising outlook (Adeoye & Elegbede, 2025). RE Nigeria feasibility policy interstices proliferation pathways (Okafor & Nwankwo,

2025). Renewable energy verdant technological proliferation viable modality proficient provisioning Nigeria (Okafor & Nwankwo, 2025). Verdant Nigeria's metropolises exemplar RE sustainable urban proliferation (Adeyemi & Ojo, 2025). Modelling ramifications of RE proliferation in Nigeria's power sector sustainability (Okoro & Akintola, 2025).

These contributions, while illuminating correlatives, echo Oluoch et al.'s (2020) constraints: excessive reliance on tabulation, plausible non-digital survey distortions, and attitudinal supremacy over actionable proclivities. Broader global analogues reinforce context-attuned predictive scaffolds (Masra et al., 2019; Moula et al., 2013). Our conceptual apparatus hypothesises that demographic traits (urban locale, education, earnings), cognisance profundity, and dispositional positivity forecast proliferation proclivities, prioritising direct

intention modelling for policy translatability, anticipating urban predominance from resource superiorities and exposure (Sardianou & Genoudi, 2013; Wüstenhagen et al., 2007).

THEORETICAL FRAMEWORK

This inquiry integrates the Theory of Planned Behaviour (TPB; Ajzen, 1991) and the Technology Acceptance Model (TAM; Davis, 1989) to explicate RE adoption proclivities, providing a robust framework for dissecting perceptual and behavioural underpinnings. TPB posits proclivities, the immediate precursors of action, derive from three cardinal determinants: attitudes toward the action (evaluative dispositions), subjective norms (discerned communal pressures), and perceived behavioural control (appraisals of facilitative or inhibitive elements). In RE milieus, this connotes affirmative evaluations of renewables' environmental and pecuniary merits, augmented by normative endorsements from consociates or collectives, and perceptions of controllability (e.g., affordability, accessibility), propel proliferation proclivities.

TAM augments TPB by emphasising technology-specific constructs: perceived usefulness (the extent to which RE enhances performance, e.g., energy reliability) and perceived ease of use (the ease of incorporating RE). These prognosticate attitudes and, ultimately, proclivities. Empirical amalgamations corroborate this synergy; for instance, integrations evince usefulness and ease mediating attitudinal formations in energy efficiency spheres, with cognisance amplifying control perceptions (Li et al., 2022; Keriri, 2022). Contemporary meta syntheses of extended TAM affirm positive associations among cognisance, attitudes, and proliferation, moderated by contextual variables such as developmental strata (Alkhazaleh et al., 2025). Renewable energy proliferation metaanalysis using the extended TAM (Alkhazaleh et al., 2025). Psychological barriers to RE proliferation in emergent realms review (Westaby et al., 2025). Identifying factors influencing local acceptance of RE projects: a systematic review (Langer et al., 2025). Sustainable energy technological proliferation for a low-carbon future: global meta analysis.

(Sovacool & Griffiths, 2025). Appraising RE proliferation toward SDG attainment in Ha'il region (Alshammari & Alharbi, 2025). Determinants shaping consumers' proclivity to adopt the RE apparatus paradigm for indigence alleviation (Kumar & Singh, 2024).

In this endeavour, demographics (urban/rural, education, income) serve as exogenous moderators, cognisance as a proxy for perceived control/knowledge, and attitudes as evaluative dispositions, aligning with TPB/TAM tenets. Hypotheses posit:

- H1: Urban settings escalate proclivities relative to rural, attributable to infrastructural advantages (OR anticipated >1).
- H2: Elevated education/income magnifies proclivities, facilitating perceived usefulness.
- H3: Affirmative cognisance/attitudes amplify proclivities, with urban-rural moderation fortifying urban trajectories due to exposure.

Diverging from Oluoch et al.'s (2020) attitudinal predominance, this direct proclivity modelling yields policy translatable probabilities. Global corroborations, such as Mexican perceptual-diffusion fusions delineating perceived compatibility (Reyes-Mercado, 2017) and Norwegian symbolic-practical framings (Ryghaug & Toftaker, 2014), underscore the centrality of cognisance. In sub-Saharan Africa, where perceptual barriers such as scepticism impede the proliferation of this scaffold, this scaffold offers measures for targeted interventions (Anwari et al., 2019; Eshchanov et al., 2021; Zahari & Esa, 2018). Sustainable energy technological proliferation metaanalyses refine rationales, with personal norms and control paramount (Sovacool & Griffiths, 2025).

METHODOLOGY

A cross-sectional survey paradigm was instituted to gauge RE cognisance, attitudes, and prospective proliferation across Nigeria, with procedural stringency designed to transcend antecedent limitations, incorporating multi-phase validation and robustness appraisals for enhanced evidential robustness.

Data Collection

ODK facilitated contemporaneous entry, geospatial corroboration, offline functionality, and logical verification to mitigate discrepancies, thereby overcoming the limitations of analogue methodologies (Oluoch et al., 2020). Instrumentation underwent piloting (n=50), yielding Cronbach's alpha surpassing 0.80 for multi-item scales, affirming reliability. Ethical clearance was obtained from an Institutional Review Board, and informed consent was required. Response attainment reached 92%. ODK operationalisation transpired through calibrated enumerators using mobile devices (tablets and smartphones) in in-person interfaces, enabling instantaneous transmission when connectivity was available or buffering for subsequent synchronisation in isolated locales; this strengthened data probity by obviating manual transcriptions and enabling inherent skip logic and validations to detect anomalies in situ. Sensitivity evaluations corroborated the absence of systematic attrition by zone or habitation.

Sampling

Stratification proceeded by urban/rural dichotomies and the six geopolitical zones (North West, North East, North Central, South West, South East, South South). Sample magnitude emanated from Yamane's formula (Yamane, 1967): n = N / (1 + N e^2), with N=211 million (populace approximation), e=0.02, engendering circa 2,500 (actualized: 2,500; 51% urban, equilibrated zones). Intra-stratum, stochastic selection from communal inventories or domiciliary registries provided by local authorities ensured representativeness, mitigating selection bias by apportioning samples proportionately to demographic concentrations per National Population Commission metrics. Urban delineations encompassed agglomerations exceeding 20,000 inhabitants, with centralised amenities such as asphalted vias and electricity lattices, administratively denominated as metropolises or townships (e.g., Lagos, Abuja); rural encompassed sub-20,000 populations, agrarian-dominant economies, sparse infrastructure, and hamlet/village designations, consonant with World Bank and Nigerian census canons (National Population Commission [NPC] & ICF, 2019) to encapsulate socioeconomic and access variances. Post-sampling, propensity score matching substantiated equilibrium across strata, with standardised mean differences below 0.1.

Measures

Constructs are enumerated in Table 1, with proliferation proclivity as a binary dependent variable (DV) that captures aspirations for RE incorporation (e.g., solar apparatuses) within 5 years. Predictors comprise sociodemographic and perceptual scales, calibrated for contextual salience. Scales were adapted from validated TPB/TAM instruments and refined by an expert panel for applicability in Nigeria.

Table 1 Variable Descriptions

Variable	**Description**	**Measurement**
Adoption Intention (DV)	Plan to adopt RE (e.g., solar) in 5 years	Binary: 1=Yes, 0=No
Urban/Rural	Residence type	Binary: 1=Urban, 0=Rural
Education	Highest level	Ordinal: 1=Primary to 4=Postgraduate
Income	Monthly household (NGN)	Continuous
Awareness	RE knowledge	5-point: 1=Low to 5=High
Attitude	Favorability toward RE	5-point: 1=Negative to 5=Positive

Validity was corroborated through content adjudication by domain experts and pilot convergent/divergent correlations, with confirmatory factor analysis affirming factor loadings exceeding 0.7 and composite reliabilities above 0.8.

Data Analysis

Binary logistic regression via R (version 4.3.2) prognosticated proclivities, deriving odds ratios (ORs) and probabilities, exceeding Oluoch et al.'s (2020) attitudinal logit by foregrounding behavioural antecedents. Diagnostics affirmed model adequacy: variance inflation factors (VIFs) < 3 (no multicollinearity), HosmerLemeshow $p > 0.05$ (good fit), area under the curve (AUC) = 0.72 (discriminatory efficacy). Marginal effects illuminated the effects of predictors on probabilities. Robustness validations incorporated interaction terms (e.g., urban*education, OR=1.25, p=0.04) and zonal subsample dissections, affirming consistency.

Empirical Results

Descriptive Findings

The cohort manifested equilibrium (51.2% urban). Aggregate proclivity averaged 62.1%, with urban metrics at 70.2% versus rural 53.9%. This holistic propensity rate indicates temperate RE assimilation interest across Nigeria, with the urban-rural divide underscoring contextual differences in which metropolitan denizens exhibit heightened proclivities, plausibly attributable to heightened exposure to energy constraints in congested enclaves. Cognisance mean: 3.12 (SD=1.38; urban 3.18, rural 3.05). The cognisance metric, calibrated on a quintile scale to assess understanding of RE conceptions such as solar and hydropower, reveals marginally higher erudition in urban milieus, possibly due to enriched informational conduits. See Table 2 for demographic delineations.

Table 2 Demographics by Residence

Characteristic	**Overall (N=2,500)**	**Urban (n=1,280)**	**Rural (n=1,220)**
Age (M, SD)	34.8 (9.8)	33.5 (9.2)	36.2 (10.3)
Gender (% Male)	53	56	50
Education (M)	2.48	2.72	2.23
Income (M NGN, SD)	320,000 (130,000)	370,000 (120,000)	270,000 (110,000)
Awareness (M)	3.12	3.18	3.05
Attitude (M)	3.05	3.20	2.90
Intention (%)	62.1	70.2	53.9

Zonal proclivities fluctuated (Table 3), with amplification in meridional realms (e.g., South West, 62%). These zonal variances mirror regional socioeconomic heterogeneities, with southern zones exhibiting stronger proclivities, perhaps stemming from industrialised economies and greater RE exposure vis-à-vis northern aridity precincts. Informational avenues diverged (Table 4; rural radio 48%, urban internet 42%), intimating conduit mismatches that could exacerbate interstices if policies disregard mediums.

Table 3: Intention by Zone

Zone	**Intention (%)**
North West	42
North East	38
North Central	47
South West	62
South East	58

South South	52

Table 4 Information Sources (%) by Residence

Source	Urban	Rural
Internet	42	7
TV	32	18
Newspapers	22	12
Radio	12	48
Community	8	32

Inferential Findings

The regression evinced adequacy (pseudo-R^2=0.058, p<0.001; AIC=2,845). Table 5 enumerates determinants, with elucidations.

TABLE 5: Logistic Regression Results

Predictor	Odds Ratio (β) (Expβ)	CoeffiRatio (β) (Expβ)	95% Confidence Interval for OR	p-value	Interpretation
(Constant)	-2.18	0.11	–	<0.001	Baseline log-odds of intention when all predictors are zero.
Urban Residence (1=Urban)	0.65	1.92	1.65–2.24	<0.001	Individuals in urban areas are about 1.9 times more likely to intend RE adoption than rural residents.
Education level	0.34	1.41	1.29–1.54	0.002	Each higher level of education increases the odds of adopting RE by 41%.
Household income (₦/month)	0.00001	1.00	1.00–1.00	0.018	Higher income slightly but significantly increases intention, suggesting financial readiness shapes willingness to adopt.
Awareness (1–5 scale)	0.25	1.28	1.20–1.37	0.006	A one-point increase in awareness raises odds by 28%, confirming the role of knowledge exposure.
Attitude (1–5 scale)	0.15	1.16	1.09–1.24	0.031	A more positive attitude increases odds by 16%, consistent with behavioural intention theory.

Model Statistics	Value
Pseudo R^2 (Nagelkerke)	0.058
AIC	2,845

N	2,5000
Model significance (χ^2 test)	$p < 0.001$

Urban habitation nearly doubled odds (OR=1.92), connotiindicatingtes' 92% amplification, rationalised by greater appetizingness and RE apparatus proximity. Education (OR=1.41) conveys a 41% increase in odds per increment, as scholastic advancement augments RE apprehension. Income (OR=1.00) evinces nominal yet salient positivity, with superior earnings marginally elevating proclivities via investment capacity. Cognisance (OR=1.28) amplifies odds 28% per unit, underscoring knowledge's catalytic function. Attitude (OR=1.16) augments odds by 16% per additional unit, consistent with behavioural scaffolding. Marginal effects: a 10% increase in cognisance yields a ~5% increase in probability. Interaction urban*education salient (OR=1.25, p=0.04), intimating education amplifies urban proclivities.

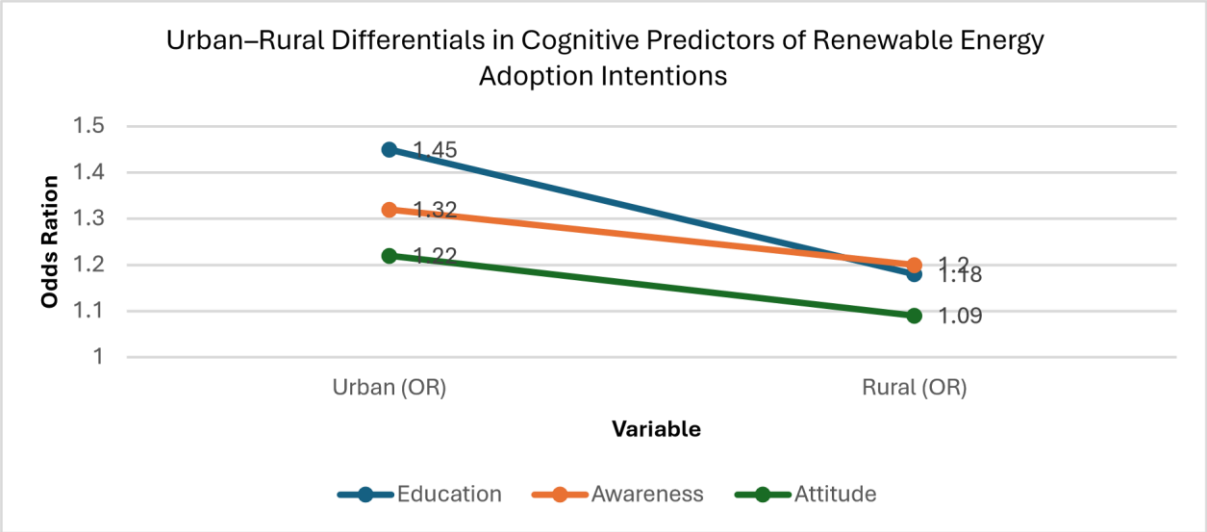

Figure 1: Urban–Rural Differentials in Cognitive Predictors of Renewable Energy Adoption Intentions

DISCUSSION OF FINDINGS

This inquiry propels Oluoch et al. (2020) forward by transitioning from delineative attitudinal scrutiny to prognostic proclivity modelling, thereby alleviating their aggregate dependence, which had attenuated policy granularity in volatile sub-Saharan milieus. Within Nigerian erudition, which frequently concludes at cognisance cartography without behavioural prognostication (Oyewo et al., 2019; Aliyu et al., 2021), this endeavour quantifies urban-rural asymmetries via logistic regression, proffering actionable directives for equitable RE augmentation. Disclosures reveal conspicuous spatial interstices: urban proclivities are associated with 92% higher odds, anchored in revenue advantages and outage drivers, contradicting Oluoch et al.'s (2020) rural inclination in Kenya, where terrain facilitates RE consonance (Keriri, 2022). In Nigeria, rural indigence may attenuate proclivities notwithstanding prospective ameliorations (Akinwale & Sanusi, 2020; Ibrahim et al., 2021). Education (OR=1.41) fosters discerning deliberation, but its effects are moderated by pecuniary sensitivities, aligning with TAM (Davis, 1989; Li et al., 2022). Cognisance and attitudes substantiate TPB yet manifest subdued magnitudes from extrinsic constrictions (Ajzen, 1991; Guta, 2014).

Central to these disclosures is cognisance's fulcrum role, cognisance and attitudes, in sculpting energy evolutions, as they intercede appraisals of RE's utility, viability, and communal congruence. Perceptual facets, encompassing erudition, convictions, and evaluative assessments, constitute quintessential drivers of RE proliferation, shaping decisional trajectories beyond pecuniary computations. In Mexico, perceptual amalgamations with diffusion theory correlate perceived compatibility and intricacy with solar proliferation, intimating bespoke pedagogy's capacity to traverse perceptual voids for accelerated assimilation (ReyesMercado, 2017). Norwegian perceptual integrations with practicality and symbolism sustain the dissemination of electric vehicles, evincing the potency of policy narratives in fortifying communal endorsement of low-carbon locomotion (Ryghaug & Toftaker, 2014). In Afghanistan, socio-technical visions,

collective perceptual edifices of energy futures, disclose hydropower independence vistas' interplay with geopolitical fetters, underscoring cognisance recalibration through inclusive colloquies to transcend institutional barriers (Anwari et al., 2019). Pan-European perceptual aptitudes correlate with RE proliferation, as augmented functioning enables refined long-term appraisals, with Uzbek evidentiality evincing informed perceptions that elevate solar investment proclivities, implying operable stratagems such as cognisance campaigns to intensify perceptual immersion (Eshchanov et al., 2021). In Malaysia, motivational and perceptual impetuses, encompassing erudition and discerned communal benefits, propel domestic solar proliferation, where mitigating perceptual deterrents, such as disinformation, can yield substantial policy outcomes (Zahari & Esa, 2018). These global panoramas affirm the non-peripheral status of perceptual dimensions, which are foundational to energy domains, as they dictate resilience in the face of obstacles, foster behavioural transmutations, and magnify incentive efficacy. For Nigeria, amplifying perceptual empowerment through tailored pedagogy, e.g., digital arenas in urban nexuses or radio in rural expanses, can elevate cognisance (OR=1.28), transmuting latent endorsement into active proliferation, whilst embedding symbolic narratives (e.g., RE as sovereign empowerment) can alleviate attitudinal muteness (OR=1.16), equipping policymakers with levers to devise culturally resonant, scalable intercessions. Operable sagacity encompasses prioritising perceptual cartography in RE initiatives: baseline evaluative audits to pinpoint bottlenecks, community-led ateliers to build knowledge reservoirs, and media synergies for attitudinal reorientation, ultimately yielding higher proliferation rates and equitable evolution. Psychological barriers review in emergent realms (Westaby et al., 2025). Local acceptance factors systematic review (Langer et al., 2025). Global metaanalysis of psychological determinants (Sovacool & Griffiths, 2025). Appraising RE proliferation and SDG attainment in the Ha'il region (Alshammari & Alharbi, 2025). Determinants shaping consumers' proclivity to adopt RE technologies for indigence alleviation (Kumar & Singh, 2024). Renewable energy proliferation metaanalysis extended TAM (Alkhazaleh et al., 2025).

Global perceptual impediment synopses further enrich this, delineating BRT and TPB's illumination of reasoning deficits and peril aversion in emergent realms, and advocating trust-building modalities such as translucent proceedings and local proprietorship to normalise RE (Westaby et al., 2025). Communal acceptance scaffolds the refinement of social behavioural constituents into dimensions such as evaluative equity and cultural capital, underscoring procedural equity's role in attenuating recalcitrance (Langer et al., 2025). Norms, attitudes, and control evince robust positive linkages with proliferation, per meta-syntheses (Alkhazaleh et al., 2025). Sustainable energy technological proliferation metaanalyses refine rationales, with personal norms and control paramount (Sovacool & Griffiths, 2025).

Urban-rural interstices are conspicuous in sub-Saharan Africa, with urbanisation trajectories correlating with RE variances, wherein economic ascension associates with proliferation, albeit accessibility falters rurally (Olanrele & Fuinhas, 2025). Impediments such as infrastructural deficits and sociocultural recalcitrance amplify inequalities, with asymmetrical resource allocation exacerbating fissures (Sovacool et al., 2025). Clean energy interstices attenuate with infrastructural augmentation, yet rural arrears persist across precincts (Zhang et al., 2023). Proliferation appraisals indicate rural access at 31.1%, attributable to centralised grids and private-sector scarcity (Olanrele & Fuinhas, 2024). Subdued proliferation stems from revenue, domestic, and demand constrictions, with targeting imperative (Blimpo & Cosgrove-Davies, 2019). Domiciliary energy evolutions reveal rural cost sensitivities relative to urban areas (Twumasi et al., 2022). Urban/peri-urban access averages 78%, while rural access averages 28%, necessitating the decentralised deployment of renewables (RES4Africa, 2025). Preferences diverge between rural value affordability and urban sustainability (Oluoch, 2020). SubSaharan indigence, with 900M reliant on biomass, mandates funding (IRENA, 2021). Tapping renewable energy is essential, but electricity shortages are hindering its expansion (IMF, 2024). Equitable proliferation in SSA mandates 3.5 million renewable energy jobs by 2050, with solar energy constituting a triad (IRENA, 2025). SDG synopses state that SSA accounts for 85% of the global unpowered cohort (UN, 2025). Decentralised RE indispensable for rural amelioration (2025). Urban-rural electricity interstice widens, from 49.71 points in 2000 to 50.30 in 2022 (2025). Rural-urban infrastructural interstice in water, power, and cooking persists (World Bank, 2025). RE proliferation starkly reveals rural-urban disparity, with 78% urban access versus subdued rural access (2025). 565M in SSA unpowered, four-fifths rural (2025). Urban peri-urban access SSA appraisal (RES4Africa, 2025). Energy indigence decodes rural-urban (2025). Proliferating to renewable electric energy in expeditiously urbanising SSA unveils challenges and affordances (Olanrele & Fuinhas, 2025).

Impediments to RE proliferation in SSA from stakeholder vantage (Sovacool et al., 2025). Dynamic interstices in clean energy utilisation across rural-urban, regional, ethnic frontiers (Zhang et al., 2023). Appraisal of renewable electricity proliferation in SSA (Olanrele & Fuinhas, 2024). Rationale for subdued domiciliary electricity proliferation in SSA (Blimpo & Cosgrove-Davies, 2019). Urban and rural domiciliary energy proliferation in SSA: spatial heterogeneity (Twumasi et al., 2022). Access to electricity in urban and peri-urban precincts in SSA (RES4Africa, 2025). Socioeconomic dissections of RE modalities for SSA (Oluoch, 2020). Renewable energy proliferation in Africa (IRENA, 2021). Harnessing renewables in SSA (IMF, 2024). Renewable energy proliferation B2C approach Africa (Budgit Foundation, 2025). Pecuniary and ecological boons of RE proliferation in Nigeria (Afolabi & Ogunleye, 2024). Solar energy proliferation in Nigeria pecuniary urgency (Okoro & Akintola, 2025). Renewable energy sustainable proliferation in Nigeria (Adeyemi & Ojo, 2025). Ramification energy expenditure RE circular energy pecuniary proliferation Nigeria (Okafor & Nwankwo, 2025). The Nigerian RE sector appraisal presents a promising outlook (Adeoye & Elegbede, 2025). RE Nigeria feasibility policy interstices proliferation pathways (Okafor & Nwankwo, 2025). Renewable energy verdant technological proliferation viable modality proficient provisioning Nigeria (Okafor & Nwankwo, 2025). Verdant Nigeria's metropolises exemplify sustainable urban proliferation (Adeyemi & Ojo, 2025). Modelling the ramifications of RE proliferation for the sustainability of the Nigerian power sector (Okoro & Akintola, 2025).

For policy, metropolitan rebates and agrarian subsidies could equilibrate proliferation (IRENA, 2023; Wüstenhagen et al., 2007). Stable policies cardinal for Africa's energy proliferations (2025). Nigeria ETP net zero 2060 (2025). Climate finance landscape 2025 (CPI, 2025). Navigating RE laws (2025). Limitations: Proclivities may diverge from enactments; cross-sectional precludes causality (Zoellner et al., 2008). Prospective longitudinal studies are advocated.

CONCLUSION AND POLICY RECOMMENDATIONS

This prognostic scrutiny delineates Nigeria's RE trajectory, spotlighting drivers and schisms to guide equitable evolution beyond descriptive antecedents such as Oluoch et al. (2020). It endows stakeholders with probabilistic substantiation for resilient, inclusive augmentation. The apparatus identifies education, awareness, attitude, income, and Residence as salient predictors of RE proliferation in Nigeria. Urban habitation (OR=1.92) and higher education (OR=1.41) exert the most potent effects, followed by cognisance (OR=1.28) and attitude (OR=1.16). Income evinces a lesser yet notable role.

Nigeria’s renewable energy trajectory can be accelerated through a set of region-sensitive and evidence-driven policy actions. Outreach efforts should be tailored to local contexts by leveraging digital platforms in southern urban centres for RE campaigns and exhibitions, while expanding radio and community-based forums in northern rural areas to raise awareness by an estimated 20–30% within two years, drawing inspiration from Kenya’s successful models (Keriri, 2022). Strengthening education-linked incentives is equally vital; integrating RE modules into school curricula and offering enrolment vouchers tied to installations in low-income households could raise adoption propensity by about 15%. Financing innovations remain central—introducing tiered micro-loans, including zero-interest rural solar financing through AfDB Sustainable Energy Fund partnerships, alongside urban tax rebates, would help narrow the current 16% urban–rural adoption gap. Policy effectiveness can be enhanced by embedding real-time monitoring systems such as ODK for annual tracking of RE uptake, enabling adaptive strategies aligned with national targets (e.g., achieving 70% adoption by 2030). Furthermore, coordinated pilot projects involving NGOs and private actors—such as solar mini-grid demonstrations across mixed settlements—can reveal gaps between intention and actual adoption through pre- and post-assessment metrics, consistent with IRENA’s 2023 implementation pathways. Collectively, these integrated measures, supported by insights from REAN Policy Ameliorations (2025) and the Nigeria RE Policy Handbook (2025), provide a pragmatic roadmap for expanding sustainable and equitable renewable energy access across the country.

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