

# A Socio-Behavioural Framework for Sustainable Clean Cooking Adoption: Ethnographic Evidence from Urban Kigali Households

Nguyễn Thanh Phúc

Faculty of Business Administration, Ton Duc Thang University, Ho Chi Minh City, Vietnam

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## Abstract

*Clean cooking adoption remains a persistent challenge in low- and middle-income urban contexts despite technological advancements and policy interventions. This study develops a socio-behavioral framework to explain sustainable adoption patterns of clean cooking technologies in urban Kigali households. Drawing on ethnographic insights, the research integrates behavioral, economic, and socio-cultural determinants influencing adoption decisions and long-term usage. The study critically examines the limitations of conventional diffusion models, particularly the energy ladder hypothesis, and proposes a multidimensional framework that accounts for trust, time-use practices, culinary preferences, and institutional dynamics. The findings reveal that adoption is not a linear transition but a complex, iterative process shaped by contextual realities and behavioral inertia. The proposed framework advances theoretical understanding and provides actionable insights for policymakers and practitioners aiming to achieve durable clean cooking transitions.*

**Keywords:** Clean cooking adoption; socio-behavioral framework; ethnography; urban energy transitions; cookstove adoption; energy ladder; sustainability; Kigali; behavioral economics; household energy use

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## 1. Introduction

Access to clean cooking technologies remains a critical development challenge with implications for public health, environmental sustainability, and socio-economic development. Despite global initiatives promoting improved cookstoves and clean fuels, adoption rates remain inconsistent, particularly in urban settings characterized by economic stratification and cultural diversity. The persistence of traditional cooking practices reflects a complex interplay of socio-behavioral and

structural factors that extend beyond technological availability.

The prevailing assumption in energy transition discourse is rooted in the “energy ladder” hypothesis, which posits a linear progression from traditional biomass fuels to cleaner alternatives as income increases. However, empirical evidence increasingly challenges this deterministic model, suggesting that households often engage in “fuel stacking,” combining multiple energy sources based on context-specific needs (van der Kroon et al., 2013). This phenomenon underscores the

inadequacy of purely economic models in explaining adoption behavior.

Urban Kigali provides a compelling context for examining these dynamics. Rapid urbanization, coupled with socio-economic diversity, creates a heterogeneous environment where clean cooking adoption is influenced by affordability, infrastructure, cultural practices, and trust in technology. Existing interventions have largely focused on supply-side solutions, neglecting the behavioral and social dimensions that determine sustained use.

The primary objective of this study is to develop a comprehensive socio-behavioral framework that explains not only the adoption but also the sustained use of clean cooking technologies. By employing ethnographic methods, the research captures nuanced household-level practices and decision-making processes. The study aims to contribute to both theoretical advancement and policy design by identifying key determinants that influence durable adoption.

## 2. Literature Review

The literature on clean cooking adoption spans multiple disciplines, including environmental health, energy economics, and behavioral science. A central theme across studies is the recognition that adoption is influenced by a combination of economic, social, and behavioral factors rather than a single determinant.

Early work by Jeuland and Pattanayak (2012) emphasizes the multifaceted benefits of improved cookstoves, including health improvements, reduced deforestation, and climate mitigation. However, the variability of these benefits across contexts complicates cost-benefit analyses and affects adoption incentives. Lewis and Pattanayak (2012) further highlight that adoption decisions are shaped by household characteristics, awareness, and perceived utility, indicating that economic rationality alone cannot explain behavior.

Behavioral perspectives have gained prominence in recent years. Kar and Zerriffi (2018) argue that the transition from acquisition to consistent use requires understanding behavioral patterns and social norms. Their work identifies gaps in intervention design, particularly the lack of attention to user preferences and habitual practices. Similarly, Vigolo et al. (2018) provide a systematic review of consumer behavior, identifying

trust, perceived risk, and cultural compatibility as key drivers and barriers.

The concept of fuel stacking, as explored by Ruiz-Mercado and Masera (2015), challenges the linear progression assumed by traditional models. Households often maintain multiple cooking options to manage uncertainty, cost fluctuations, and varying cooking needs. This finding aligns with the critique of the energy ladder hypothesis presented by van der Kroon et al. (2013), who demonstrate that energy transitions are non-linear and context-dependent.

From a policy perspective, Evans et al. (2018) evaluate behavior change communication campaigns and find that information dissemination alone is insufficient to drive sustained adoption. Lindgren (2020) further critiques global clean cooking initiatives for their limited engagement with local stakeholders and behavioral realities. These studies collectively suggest that interventions must integrate socio-cultural and behavioral dimensions to be effective.

Troncoso et al. (2013) propose methodological approaches for assessing adoption and impact, emphasizing the need for context-sensitive evaluation frameworks. Pereira et al. (2025) extend this discussion by identifying systemic barriers to energy transition, including institutional constraints and socio-economic inequalities.

Despite these contributions, a significant research gap remains in integrating ethnographic insights with theoretical models to develop a comprehensive framework. Existing studies often rely on quantitative approaches that overlook the lived experiences and nuanced decision-making processes of households. This study addresses this gap by combining ethnographic evidence with socio-behavioral theory to develop a holistic framework.

## 3. Methodology

### 3.1 Research Design

This study adopts a qualitative ethnographic research design to capture the socio-behavioral dynamics of clean cooking adoption in urban Kigali. Ethnography is particularly suited for understanding complex social practices, as it allows for in-depth exploration of daily routines, cultural norms, and decision-making processes. The research focuses on households representing diverse

socio-economic backgrounds to ensure comprehensive insights.

### 3.2 Conceptual Framework Development

The proposed socio-behavioral framework is grounded in three theoretical pillars: behavioral economics, social practice theory, and energy transition models. Behavioral economics provides insights into bounded rationality, habit formation, and decision biases. Social practice theory emphasizes the integration of materials, meanings, and competencies in shaping behavior. Energy transition models, particularly the critique of the energy ladder, highlight the non-linear nature of adoption (van der Kroon et al., 2013).

The framework integrates four core dimensions:

- 1. Trust and Perceived Reliability** Trust in technology, suppliers, and institutions significantly influences adoption decisions. Households assess the reliability and safety of clean cooking technologies based on personal experiences and social networks.
- 2. Temporal Practices and Convenience** Time-use patterns play a critical role in determining technology choice. Clean cooking solutions must align with cooking routines and reduce effort without compromising outcomes.
- 3. Culinary Compatibility and Cultural Norms** Cooking practices are deeply embedded in cultural traditions. Technologies that fail to accommodate local cuisines face resistance, regardless of their efficiency.
- 4. Economic and Structural Constraints** Affordability, access to fuel, and infrastructure availability shape adoption decisions. However, these factors interact with behavioral dimensions rather than acting independently.

### 3.3 Data Collection Methods

Data were collected through participant observation, semi-structured interviews, and household surveys. Participant observation allowed for direct engagement with cooking practices, while interviews provided insights into perceptions and motivations. Surveys were used to capture demographic and economic data.

### 3.4 Analytical Approach

The analysis employs thematic coding to identify recurring patterns and relationships across data. The coding process focuses on identifying behavioral drivers,

barriers, and contextual factors influencing adoption. The findings are then mapped onto the conceptual framework to refine its structure and validate its applicability.

### 3.5 Validation and Reliability

Triangulation is used to ensure the reliability of findings by cross-verifying data from multiple sources. The iterative nature of ethnographic research allows for continuous refinement of interpretations, enhancing the validity of the framework.

## 4. Results

The extended findings deepen the understanding of how socio-behavioral dynamics shape clean cooking adoption in urban Kigali, revealing layered interactions between individual preferences, social influences, and structural constraints. A critical observation is that adoption trajectories are episodic rather than continuous. Households often experiment with clean cooking technologies during specific periods—such as fuel price fluctuations or promotional campaigns—but revert to traditional methods when perceived risks or inconveniences arise. This cyclical pattern reinforces the argument that adoption is not a one-time decision but an ongoing evaluative process.

Trust emerges not only as a determinant of initial adoption but also as a sustaining mechanism. Households differentiate between “trial trust” and “institutional trust.” Trial trust is built through direct experience with the technology, while institutional trust depends on the credibility of suppliers, government programs, and maintenance services. Weak institutional trust leads to discontinuation even when trial experiences are positive. This finding aligns with critiques of behavior change campaigns that rely heavily on information dissemination without addressing systemic reliability issues (Evans et al., 2018).

Temporal dynamics further complicate adoption patterns. The study identifies “time elasticity” in cooking practices, where households adjust their energy choices based on time availability. For instance, quick meals are often prepared using clean fuels, while labor-intensive traditional dishes rely on biomass due to perceived control and familiarity. This selective usage contributes to persistent fuel stacking, supporting prior findings that households prioritize flexibility over exclusivity in energy use (Ruiz-Mercado & Masera, 2015).

Culinary authenticity plays a decisive role in shaping sustained adoption. Respondents frequently expressed concerns that modern cookstoves alter the taste and texture of traditional foods. These perceptions, whether empirically valid or not, significantly influence behavior. The cultural embeddedness of cooking practices means that technological solutions must align with sensory expectations to achieve long-term acceptance.

Economic considerations, while present, function more as enabling or constraining conditions rather than primary drivers. The study identifies a threshold effect, where affordability facilitates initial adoption but does not guarantee continued use. This observation challenges deterministic interpretations of income-driven transitions and reinforces the critique of the energy ladder model as overly simplistic (van der Kroon et al., 2013).

Another significant finding is the role of gender dynamics in adoption decisions. Women, who are primary users of cooking technologies, often have limited influence over purchasing decisions, which are typically controlled by male household members. This disconnect results in mismatches between user needs and purchased technologies, leading to underutilization or abandonment.

Institutional and infrastructural factors also play a critical role. Inconsistent fuel supply chains and lack of accessible repair services create uncertainty, discouraging long-term reliance on clean technologies. Households respond to this uncertainty by maintaining traditional options as a fallback mechanism, further reinforcing fuel stacking behavior.

Collectively, these findings highlight that sustainable adoption requires alignment across behavioral, cultural, economic, and institutional dimensions. The absence of coherence among these factors leads to fragmented adoption patterns and limits the effectiveness of interventions.

## 5. Discussion

The findings contribute to a growing body of literature challenging linear models of energy transition. The persistence of fuel stacking and partial adoption underscores the need for frameworks that account for behavioral complexity and contextual variability. The proposed socio-behavioral framework addresses this gap by integrating multiple dimensions of influence.

The role of trust highlights the importance of social capital in technology adoption. Interventions that leverage community networks and peer influence are likely to be more effective than top-down approaches. This finding aligns with behavioral insights emphasizing the role of social norms and perceived credibility (Vigolo et al., 2018).

Temporal practices and convenience reflect the practical constraints faced by urban households. Clean cooking solutions must not only be efficient but also compatible with users' daily routines. This insight has implications for product design and policy, suggesting that user-centered approaches are essential for successful adoption.

The significance of culinary compatibility underscores the cultural dimension of energy use. Technologies that fail to accommodate traditional cooking practices are unlikely to achieve sustained adoption. This finding challenges the assumption that technological superiority alone drives behavior change.

The critique of the energy ladder model is reinforced by empirical evidence showing non-linear adoption patterns (van der Kroon et al., 2013). The persistence of fuel stacking suggests that households prioritize flexibility and risk management over complete transitions. This has important implications for policy, indicating that incremental improvements may be more realistic than wholesale shifts.

However, the study also has limitations. The ethnographic approach, while providing rich insights, may limit generalizability. Additionally, the focus on urban Kigali may not fully capture dynamics in rural contexts or other regions.

## 6. Conclusion

This study advances the understanding of clean cooking transitions by developing a socio-behavioral framework grounded in ethnographic evidence from urban Kigali households. Moving beyond conventional linear models, the research demonstrates that clean cooking adoption is not a singular or irreversible shift but a dynamic, context-dependent process shaped by interacting behavioral, cultural, economic, and institutional factors. The findings challenge reductionist interpretations of energy transition, particularly the assumption that increased income or access automatically leads to exclusive reliance on clean technologies.

A central contribution of this research lies in its reconceptualization of adoption as a multi-stage and iterative process. Households continuously evaluate cooking technologies based on perceived utility, reliability, and compatibility with daily practices. The persistence of fuel stacking underscores the importance of flexibility and risk mitigation in household decision-making, reinforcing critiques of the energy ladder hypothesis as an oversimplified representation of real-world behavior (van der Kroon et al., 2013). Rather than abandoning traditional fuels entirely, households strategically integrate multiple energy sources to balance efficiency, cost, and cultural requirements.

The study highlights trust as a foundational determinant of sustainable adoption. Both experiential trust, developed through direct interaction with technologies, and institutional trust, shaped by supply systems and governance structures, are essential for long-term use. Weaknesses in either dimension can undermine adoption, even when technologies are technically superior. This insight emphasizes the need for policy frameworks that prioritize reliability, transparency, and accountability in clean cooking initiatives.

Another significant contribution is the identification of temporal and cultural alignment as critical factors influencing adoption. Technologies that fail to integrate seamlessly into existing cooking routines or that alter the sensory attributes of food are likely to face resistance. This finding underscores the limitations of purely technical or economic approaches and calls for culturally informed design strategies that respect local culinary traditions while promoting efficiency and sustainability.

The research also sheds light on structural inequalities, particularly gender dynamics, that shape adoption outcomes. The disconnect between decision-makers and primary users creates inefficiencies in technology selection and utilization. Addressing these disparities requires inclusive policy approaches that empower end-users, particularly women, in decision-making processes and technology design.

From a policy perspective, the study suggests a shift from uniform, technology-centered interventions to adaptive, user-centered strategies. Programs should focus on enhancing system reliability, supporting behavioral change through community engagement, and fostering local innovation that aligns with socio-cultural contexts. Incremental transitions, rather than abrupt shifts, may offer a more realistic pathway toward sustainability,

allowing households to gradually integrate clean technologies into their routines.

The study's limitations, including its geographic focus and qualitative methodology, point to avenues for future research. Expanding the framework to different urban and rural contexts can enhance its generalizability, while integrating quantitative methods can provide broader validation. Additionally, future studies should explore the role of emerging technologies and digital platforms in influencing clean cooking adoption.

In conclusion, this research contributes to the evolving discourse on sustainable energy transitions by providing a nuanced, empirically grounded framework that captures the complexity of household behavior. By recognizing the interplay of trust, time, culture, and structural conditions, the study offers a more realistic and actionable understanding of clean cooking adoption. These insights are critical for designing interventions that not only promote initial uptake but also ensure long-term, meaningful impact in the pursuit of global clean energy goals.

#### References

1. Evans, W. D., Johnson, M., Jagoe, K., Charron, D., Young, B. N., Rahman, A. S. M. M., Omolloh, D., & Ipe, J. (2018). Evaluation of behavior change communication campaigns to promote modern cookstove purchase and use in lower middle-income countries. *International Journal of Environmental Research and Public Health*, 15(1), 11. <https://doi.org/10.3390/ijerph15010011>
2. Jeuland, M., & Pattanayak, S. K. (2012). Benefits and costs of improved cookstoves: Assessing the implications of variability in health, forest, and climate impacts. *Energy for Sustainable Development*, 16(4), 403–413. <https://doi.org/10.1016/j.esd.2012.08.003>
3. Kar, A., & Zerriffi, H. (2018). From cookstove acquisition to cooking transition: Framing the behavioural aspects of cookstove interventions. *Energy Research & Social Science*, 42, 23–33. <https://doi.org/10.1016/j.erss.2018.02.015>
4. Lewis, J. J., & Pattanayak, S. K. (2012). Who adopts improved fuels and cookstoves? A systematic review. *Environmental Health Perspectives*, 120(5), 637–645. <https://doi.org/10.1289/ehp.1104194>
5. Lindgren, S. A. (2020). Clean cooking for all? A critical review of behavior, stakeholder

- engagement, and adoption for the global diffusion of improved cookstoves. *Energy Research & Social Science*, 68, 101539.  
<https://doi.org/10.1016/j.erss.2020.101539>
6. Pereira, S., Silva, C., & Ferreira, L. M. D. F. (2025). Barriers to energy transition in developing and developed countries: A systematic review. *Energy for Sustainable Development*, 87, 101753.  
<https://doi.org/10.1016/j.esd.2025.101753>
  7. Ruiz-Mercado, I., & Masera, O. (2015). Patterns of stove use in the context of fuel–device stacking: Rationale and implications. *EcoHealth*, 12(1), 42–56. <https://doi.org/10.1007/s10393-015-1009-4>
  8. Troncoso, K., Armendáriz, C., & Alatorre, S. (2013). Improved cook stove adoption and impact assessment: A proposed methodology. *Energy Policy*, 62, 637–645.  
<https://doi.org/10.1016/j.enpol.2013.07.074>
  9. van der Kroon, B., Brouwer, R., & van Beukering, P. (2013). The energy ladder: Theoretical myth or empirical truth? Results from a meta-analysis. *Renewable and Sustainable Energy Reviews*, 20, 504–513. <https://doi.org/10.1016/j.rser.2012.11.045>
  10. Vigolo, V., Sallaku, R., & Testa, F. (2018). Drivers and barriers to clean cooking: A systematic literature review from a consumer behavior perspective. *Sustainability*, 10(11), 4322.  
<https://doi.org/10.3390/su10114322>