

Electricity Usage Behavior and Energy Efficiency Awareness as Determinants of Household Electricity Consumption: A Systematic Literature Review

Bartho Sihombing

Sekolah Tinggi Teknologi Immanuel Medan

The increase in electricity consumption in the residential sector has made energy efficiency one of the key issues in supporting sustainable development. Various studies have examined the factors influencing household electricity consumption; however, the results remain scattered across various determinants and have not yet been comprehensively synthesized. This study aims to synthesize research findings on electricity usage behavior and energy efficiency awareness as determinants of household electricity consumption. This study employed a Systematic Literature Review (SLR) method in accordance with the PRISMA 2020 guidelines. The review process included the identification, selection, quality assessment, data extraction, and synthesis of 214 articles that met the inclusion criteria. The results of the study indicate that electricity usage behavior and energy efficiency awareness are the most dominant determinants influencing household electricity consumption. In addition, social, economic, and psychological factors, as well as the use of technologies such as smart meters and feedback systems, play a role in reinforcing more efficient energy consumption behaviors. This study also found that previous research has been dominated by partial analyses, highlighting the need for a more integrative model to explain the relationships among various determinants of household electricity consumption. The findings are expected to serve as a reference for future research and to support the formulation of more effective and sustainable energy efficiency policies.

Keywords: Energy Awareness, Energy Efficiency, Household Electricity Consumption, Household Electricity Use Behavior, Systematic Literature Review.

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Corresponding Author:

Bartho Sihombing

Sekolah Tinggi Teknologi Immanuel Medan

Jl. Gatot Subroto No.325/505, Sumatera Utara 20114. Indonesia.

E-mail: bartho.sihombing@gmail.com

1. Introduction

The increase in electricity consumption in the residential sector has become an important challenge in achieving sustainable energy use and improving household energy efficiency. Household electricity consumption is influenced by multiple factors, including appliance ownership and usage patterns, household characteristics, socioeconomic conditions, perceptions, attitudes, and individual behaviors. Empirical evidence from Indonesia shows that household electricity-saving behavior is associated with users' perceptions and daily habits in using electrical appliances, while limited information about energy-saving practices remains an important barrier to conservation behavior [1]. Evidence from Finland further indicates that higher energy-related financial literacy is associated with lower household electricity consumption after controlling for dwelling and household characteristics [2]. More recent empirical research in the United Kingdom also demonstrates that household electricity consumption is associated with a combination of physical dwelling characteristics, sociodemographic variables, behavioral factors, and attitudinal characteristics [3].

In addition to behavioral and socioeconomic factors, energy awareness and information technologies have increasingly received attention in household electricity research. An empirical study of Korean households found that high-resolution electricity feedback through smart meters produced

heterogeneous behavioral responses and that households with greater awareness of electricity costs and stronger interest in climate change were more receptive to feedback [4]. Similarly, evidence from a randomized controlled trial in Ireland indicates that smart-meter-based feedback and contextual information can contribute to changes in household electricity consumption while increasing reported knowledge of energy-saving practices [5]. These findings suggest that household electricity consumption cannot be adequately explained by a single determinant because behavioral, cognitive, socioeconomic, and technological factors may operate simultaneously.

Research developments on household electricity consumption behavior have therefore increasingly examined electricity use behavior, energy efficiency awareness, energy literacy, social influences, economic conditions, psychological characteristics, and supporting technologies. However, the available empirical evidence remains diverse in terms of variables, geographical contexts, research designs, and mechanisms examined. Consequently, an integrated synthesis is required to identify how these determinants have been investigated and how they collectively relate to household electricity consumption.

Although the literature on household electricity consumption behavior is growing, many studies continue to emphasize particular determinants or specific contexts. Some studies focus primarily on electricity use behavior, whereas others examine energy awareness, energy literacy, smart-meter feedback, social factors, economic conditions, or psychological characteristics. This diversity makes it difficult to obtain a comprehensive understanding of the relationships among these determinants and their contribution to household electricity consumption. Therefore, a systematic synthesis is needed to map research developments, identify recurring determinants, compare findings across studies, and identify gaps that remain insufficiently addressed.

Given these circumstances, this study employs a Systematic Literature Review (SLR) approach following the PRISMA 2020 guidelines to synthesize empirical research concerning electricity usage behavior and energy efficiency awareness as determinants of household electricity consumption. The review focuses on identifying research trends, recurring determinants, relationships among behavioral, social, economic, psychological, and technological factors, and opportunities for future research.

Theoretically, this study contributes by synthesizing the multidimensional determinants of household electricity consumption and by identifying how behavioral and awareness-related factors are positioned within the broader household energy literature. Practically, the findings may provide a reference for academics, policymakers, electricity service providers, and other stakeholders in designing energy-efficiency programs, educational interventions, behavioral strategies, and technology-supported household energy management.

To achieve these objectives, this study focuses on the following four Research Questions (RQs). RQ1. What is the state of the research on household electricity usage behavior and energy efficiency awareness? RQ2. What are the most consistently identified factors influencing household electricity consumption? RQ3. What is the relationship between electricity usage behavior, energy efficiency awareness, and social, economic, psychological, and technological factors regarding household electricity consumption? RQ4. What are the existing research gaps and opportunities for future studies in the field of household electricity usage behavior and energy efficiency awareness?.

2. Method

1. Research Design

This study employed a Systematic Literature Review (SLR) method in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines. This approach was chosen because it enables the systematic identification, evaluation, and synthesis of research findings, thereby yielding a comprehensive understanding of electricity usage behavior and energy efficiency

awareness as determinants of household electricity consumption. All stages of the study included the formulation of research questions, the determination of a literature search strategy, article selection, quality assessment, data extraction, and the synthesis of research findings[10].

2. Research Questions (RQ)

This study aims to answer the following research questions.

- A. RQ1. What is the state of the research on household electricity usage behavior and energy efficiency awareness?
- B. RQ2. What are the most dominant factors influencing household electricity consumption?
- C. RQ3. What is the relationship between electricity usage behavior, energy efficiency awareness, and social, economic, psychological, and technological factors regarding household electricity consumption?
- D. RQ4. What are the existing research gaps and opportunities in this field?

3. Search Strategy

The literature search was systematically conducted across nine academic databases, including Google Scholar, Scopus, ScienceDirect, Web of Science, SpringerLink, Wiley Online Library, MDPI, ResearchGate, and the Garuda/SINTA Portal. The review covered peer-reviewed journal articles published between 2020 and 2025 in English and Indonesian. A structured search string was developed using Boolean operators (AND, OR) to combine key concepts related to household electricity consumption, electricity-use behavior, and energy efficiency awareness. The search terms were adapted to each database while maintaining consistent conceptual meaning. The initial search yielded 2,148 records. After removing 512 duplicates, 1,636 records remained for screening. Title and abstract screening excluded 1,062 records, leaving 574 articles for full-text assessment. Of these, 78 articles could not be retrieved, and 282 were excluded due to irrelevance, lack of focus on the research topic, unsuitable methodology, or unavailable full text. Ultimately, 214 studies met the inclusion criteria and were included in the systematic review[11].

4. Inclusion and Exclusion Criteria

Articles were selected using the inclusion and exclusion criteria shown in Table 1.

Criteria	Inclusion	Exclusion
Publication Year	2020–2025	Publications outside the specified period
Publication Type	Peer-reviewed journal articles	Books, conference proceedings, theses, dissertations, and reports
Language	English and Indonesian	Languages other than English and Indonesian
Research Topic	Household electricity use behavior, energy efficiency awareness, and household electricity consumption	Studies not relevant to the research topic
Accessibility	Full-text articles	Abstract-only publications or incomplete articles

5. Study Selection

The article selection process follows the PRISMA 2020 guidelines, which include literature identification, duplication screening, selection based on titles and abstracts, eligibility evaluation through review of the full text, and identification of articles that meet all criteria for further analysis[12].

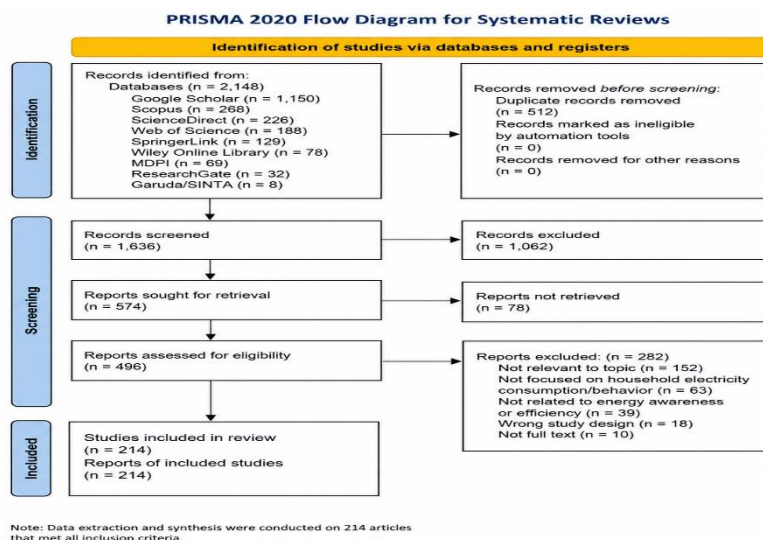


Figure 1. PRISMA 2020 Flowchart of the Study Selection Process

The diagram illustrates the process of identifying, screening, assessing eligibility, and finally selecting articles based on the PRISMA 2020 guidelines, resulting in 214 articles that met the inclusion criteria and were used in the literature synthesis process.

6. Quality Assessment

Articles that passed the selection process were evaluated based on the relevance of their research topics, the clarity of their methodologies, the comprehensiveness of their research findings, and their contribution to the discussion on household electricity consumption patterns and energy efficiency. Only articles that met the quality criteria were included in the synthesis process[13].

7. Data Extraction

Data from each article were systematically extracted, including the author's name, year of publication, country of study, research methods, variables examined, and key findings. This information served as the basis for the analysis and synthesis of the research results[14].

8. Data Synthesis

The analysis was conducted using narrative synthesis by grouping the research findings into several main themes, namely electricity usage behavior, energy efficiency awareness, energy literacy, social factors, economic factors, psychological factors, and the use of supporting technologies such as smart meters. This approach allows for the identification of research patterns, similarities and differences in findings, and the identification of research gaps that still require further study[15].

3. Results And Discussion

Characteristics of the Study

A total of 214 articles that met the inclusion criteria were analyzed in this study. The characteristics of the studies were examined based on year of publication and journal type to provide an overview of trends in research related to electricity usage behavior and energy efficiency awareness among households. The results of the analysis show that the number of publications followed an upward trend during the 2020–2024 period, with the highest number of publications occurring in 2024[16]. The articles analyzed were drawn from SINTA-accredited national journals as well as reputable international journals published by various scientific publishers, indicating that the topics of electricity consumption behavior and energy efficiency are growing fields of research that have garnered widespread attention. The distribution of publications by year is shown in Figure 2.

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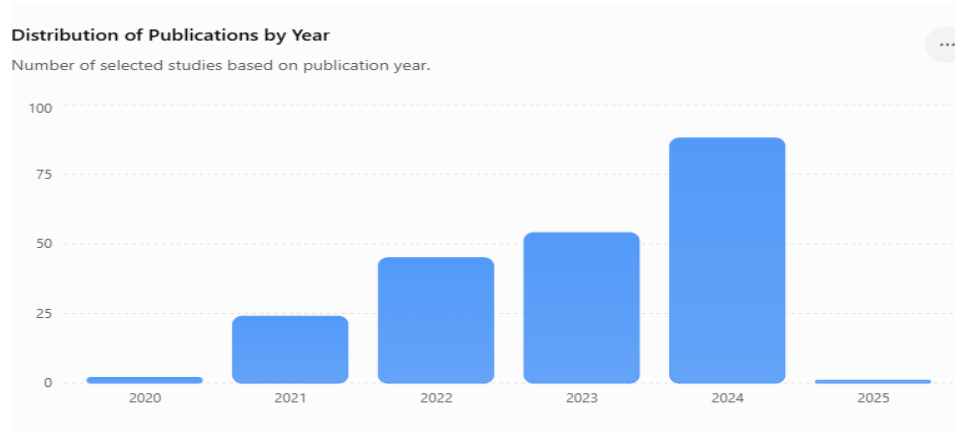


Figure 2. Distribution of Publications by Year

The distribution of articles meeting the inclusion criteria by year of publication shows an increase in the number of studies from 2020 to 2024, with the peak in publications occurring in 2024. The data was calculated based on 214 references listed in the References section.

Mapping Research Themes

Based on a synthesis of 214 articles that met the inclusion criteria, research on household electricity consumption behavior and energy efficiency can be grouped into seven main themes: household electricity consumption behavior, energy efficiency awareness, energy literacy, social factors, economic factors, psychological factors, and supporting technologies. This categorization indicates that household electricity consumption is influenced by various interacting factors, both at the individual level and within the social environment[17].

- A. Household Electricity Consumption Patterns: This topic examines habits related to the use of electrical appliances, energy consumption patterns, the duration of electronic device use, and residents' behavior regarding the use of electricity in their daily lives. Most studies indicate that electricity usage behavior is the primary factor determining household energy consumption levels[18].
- B. Energy Efficiency Awareness: Research on this topic focuses on the public's level of awareness regarding the importance of energy conservation. The findings indicate that the higher the level of energy efficiency awareness, the greater the tendency for households to adopt more energy-efficient and sustainable electricity usage practices[19].
- C. Energy Literacy: Energy literacy is often defined as an individual's ability to understand the effective and responsible use of energy. Various studies show that improved energy literacy contributes to more rational decision-making regarding the use of electrical appliances and the adoption of energy-saving behaviors[20].
- D. The Influence of Social Factors: Social factors include social norms, family roles, communities, and the influence of the surrounding environment on electricity usage behavior. The study's findings indicate that social support and habits that develop within the community can encourage the adoption of more consistent energy-saving behaviors[21].
- E. The Impact of Economic Factors: This topic examines the impact of electricity prices, income levels, electricity rates, and energy usage costs on household electricity consumption. In general, economic factors influence households' decisions regarding the intensity of their electricity use and their choice of more energy-efficient appliances[22].
- F. The Influence of Psychological Factors: Research on this topic emphasizes the role of attitude, awareness, motivation, perceived behavioral control, and intention in shaping electricity consumption

behavior. The results of the synthesis indicate that psychological factors are key determinants influencing the success of implementing energy-saving behaviors at the household level[23].

- G. Supporting Technologies: The final topic concerns the use of technologies such as smart meters, energy monitoring apps, feedback systems, and digital platforms to improve the efficiency of electricity use. Various studies show that providing real-time energy consumption data can raise user awareness and encourage behavioral changes toward more efficient energy use[24].

Summary of Research Findings

A synthesis of 214 articles shows that household electricity consumption is influenced by a combination of behavioral, social, economic, psychological, and technological factors. Although each study has a different focus, most of the findings point to the conclusion that changes in user behavior, supported by increased awareness of energy efficiency, are the most consistent factor in promoting savings in household electricity consumption[25].

Table 2. Summary of Research Findings

Synthesis Aspect	Key Findings
Most Frequently Identified Determinants	Electricity use behavior, energy awareness, energy literacy, social factors, economic factors, psychological factors, and supporting technologies were among the determinants repeatedly identified in the reviewed studies.
Most Consistently Identified Determinants	Electricity use behavior and energy efficiency awareness were among the most consistently identified determinants in the reviewed studies. Social, economic, psychological, and technological factors were also repeatedly identified as supporting or reinforcing determinants.
Relationships Among Variables	Improved energy literacy enhances energy efficiency awareness, which may subsequently promote more efficient electricity use behavior. Social, economic, psychological, and technological factors may act as supporting and reinforcing determinants in this relationship.
Research Trends	Research has evolved from a predominantly technical perspective toward a multidisciplinary approach that integrates behavioral, psychological, social, economic, and digital technological aspects in the management of household electricity consumption.

Based on this synthesis, it can be concluded that research on household electricity consumption has undergone a paradigm shift from an approach focused on technical characteristics to one that is more centered on human behavior. These findings indicate that efforts to improve energy efficiency do not depend solely on technological innovation but also require increased awareness, energy literacy, and a supportive social and policy environment that encourages sustainable behavioral change.

4. Discussion

1. Electricity Usage Behavior as a Determinant of Energy Consumption

The results of the synthesis show that electricity usage behavior is the most consistent determinant influencing household electricity consumption. Everyday behaviors, such as the intensity of electrical appliance use, the habit of turning off unused devices, and energy consumption patterns, directly contribute to the level of electricity consumption. These findings indicate that improving energy efficiency depends not only on the availability of energy-efficient technologies but also on changes in user behavior toward more prudent energy use[26].

2. The Role of Energy Efficiency Awareness

Energy awareness is a key factor in fostering energy-saving behaviors. Individuals who have a better understanding of the benefits of energy conservation tend to be better able to manage their electricity usage and adopt more efficient behaviors. This indicates that raising public awareness through education

and the dissemination of information plays a strategic role in supporting energy conservation efforts in the household sector[27].

3. The Interaction of Social, Economic, Psychological, and Technological Factors

In addition to energy behavior and awareness, the results of this synthesis indicate that social, economic, psychological, and technological factors interact with one another in shaping household energy consumption patterns. Social norms, economic conditions, individual motivations, and the use of technologies such as smart meters and feedback systems can reinforce the adoption of energy-saving behaviors. Therefore, strategies to improve energy efficiency must be implemented in an integrated manner, taking into account community characteristics and available technological developments[28].

Tabel 3. Integrated Framework of Determinants Influencing Household Electricity Consumption

Determinant	Primary Role	Interaction	Expected Outcome
Electricity use behaviour	Direct determinant	Strengthened by awareness, social, economic, psychological, and technological factors	Efficient electricity consumption
Energy awareness	Behavioural driver	Enhances energy literacy and behavioural change	Energy-saving practices
Social factors	External influence	Shapes behavioural norms through family and community	Sustainable energy use
Economic factors	Decision modifier	Influences electricity consumption through tariffs and household income	Rational electricity use
Psychological factors	Internal motivation	Affects intention and consistency of energy-saving behaviour	Long-term behavioural change
Technology	Behaviour facilitator	Provides real-time information through smart meter and feedback system	Improved household energy efficiency

This table summarizes the key determinants that influence household electricity consumption based on a review of the literature and illustrates the relationships among these determinants in promoting energy efficiency.

4. Implications for Policy and Future Research

The findings of this study indicate that energy efficiency policies should not only focus on technological development but also integrate behavioral change approaches through improved energy literacy, public education, and social support. Furthermore, future research should develop a model capable of integrating various behavioral determinants into a single analytical framework to generate more comprehensive policy recommendations that support the sustainable management of household electricity consumption. Overall, the findings of this study indicate that the success of energy efficiency policies requires a multidisciplinary approach that integrates behavioral interventions, improved energy literacy, economic policy instruments, and the use of digital technology. The integration of these various determinants is expected to encourage more efficient and sustainable changes in electricity usage behavior in the household sector[29].

5. Research Gap

The synthesis findings indicate that research on household electricity usage behavior and energy efficiency awareness has expanded significantly in recent years. Nevertheless, most studies still examine the determinants of energy consumption in isolation—such as electricity usage behavior, energy awareness, energy literacy, social factors, economic factors, psychological factors, or technology adoption—separately. As a result, the relationships among these various determinants have not been extensively analyzed within

an integrated framework, so understanding of the mechanisms influencing household electricity consumption remains limited[30].

Furthermore, the available research is still dominated by quantitative approaches that focus on specific regions or household characteristics, so the findings cannot yet be fully generalized to different social, economic, and cultural contexts. On the other hand, studies that combine behavioral approaches with the development of digital technologies—such as smart meters, feedback systems, and energy management platforms—remain relatively limited, even though these technologies are becoming increasingly prevalent in household energy management practices[31].

Given this gap, future research should develop a conceptual model that integrates behavioral, social, economic, psychological, and technological determinants to explain household electricity consumption. A more comprehensive approach is expected to yield a more complete understanding of the factors influencing energy efficiency while providing a stronger foundation for the development of sustainable energy conservation policies and strategies[32].

Implications of the Research

1. Theoretical Implications

The results of this systematic literature review reinforce the finding that household electricity consumption is a multidimensional phenomenon influenced by the interaction between electricity usage behavior, energy efficiency awareness, energy literacy, social factors, economic factors, psychological factors, and the use of technology. This synthesis provides a more comprehensive conceptual framework regarding the determinants of household electricity consumption and serves as a foundation for the development of more integrative research models in future studies[33].

2. Practical Implications

In practical terms, the results of this study indicate that efforts to improve household energy efficiency cannot rely solely on technological development but also require increased public awareness, energy literacy, and policy support that encourages behavioral changes in electricity use. The findings of this study can serve as a reference for the government, electricity service providers, and other stakeholders in designing educational programs, energy conservation policies, and the implementation of supporting technologies to improve the efficiency of electricity consumption in the household sector[34].

5. Conclusion

This study employed a Systematic Literature Review (SLR) approach based on the PRISMA 2020 guidelines to synthesize research on electricity usage behavior and energy efficiency awareness as determinants of household electricity consumption. The synthesis of 214 included studies indicates that electricity usage behavior and energy efficiency awareness were among the most consistently identified determinants discussed in the reviewed literature. Their relationships with household electricity consumption were also associated with social, economic, psychological, and technological factors, including the use of smart meters and feedback systems. The findings further indicate that household electricity consumption is a multidimensional phenomenon that cannot be adequately explained by a single determinant. Electricity use behavior and energy awareness operate within broader household and contextual conditions, including socioeconomic characteristics, psychological factors, social influences, and access to supporting technologies. The review also shows that previous studies have frequently examined individual determinants separately, resulting in fragmented evidence regarding the mechanisms through which these factors interact. Therefore, future research should develop more integrative analytical frameworks that simultaneously consider behavioral, awareness-related, social, economic, psychological, and technological determinants of household electricity consumption. Such an approach may provide a

stronger basis for developing evidence-based energy-efficiency interventions and policies that are responsive to differences in household characteristics and contextual conditions. The findings of this review can consequently serve as a foundation for future empirical research and for the development of more comprehensive household energy-management strategies.

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