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EXPLORING ECOLUXURY: CONSUMER ATTITUDES TOWARDS ENERGY-EFFICIENT TECHNOLOGIES AND SUSTAINABLE LIVING

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Abstract:
This study explores consumer attitudes towards the integration of energy-efficient technologies within the concept of ecoluxury, focusing on the economic and environmental factors influencing investment decisions. Ecoluxury is understood as a lifestyle that combines luxury with sustainability, achieved through the use of renewable energy sources (RES) and intelligent energy management systems. Based on a survey conducted among individuals and households using RES and smart technologies, the research examines the relationship between economic considerations and the adoption of energy-efficient solutions. The findings indicate a significant correlation between the perceived economic benefits, such as long-term cost savings, and consumers' willingness to invest in eco-friendly technologies. Respondents view energy-efficient technologies as an investment that not only contributes to environmental sustainability but also offers economic advantages, including reduced energy costs. The study highlights the growing awareness of ecoluxury, where modern technologies and conscious consumption shape a responsible and sustainable approach to luxury, in line with the broader green transformation.
Keywords: ecoluxury, sustainability, energy-efficient technologies, sustainable living, green transformation

1. INTRODUCTION

In recent years, the concept of luxury has undergone a significant transformation, evolving from an association with excess and ostentation to a more sustainable and responsible form of consumption (Blasch et al., 2019; Duan et al., 2023; Guan & Lin, 2024). As environmental challenges intensify and consumer awareness of ecological issues grows, there is a noticeable shift towards incorporating sustainability into the luxury sector (Blasch et al., 2019; Olsthoorn et al., 2023). Modern luxury is increasingly defined by conscious decisions that prioritize ecological responsibility, energy efficiency, and long-term economic benefits, driven by advancements in renewable energy sources (RES) and

smart energy management technologies (Deja et al., 2023; Duan et al., 2023; Jovović et al., 2025; Thirakulwanich et al., 2025).

This transformation is particularly evident in the adoption of energy-efficient technologies by households, where consumers are looking beyond the immediate costs and considering the long-term financial savings and environmental impact (Duan et al., 2023; Khan et al., 2025; Kubera & Ślusarczyk, 2024; Shang et al., 2024). The growing integration of RES and intelligent systems for managing household energy consumption reflects a new mindset, where innovation and sustainability are viewed as essential components of a high-quality lifestyle (Almihyawi & kurnaz, 2025; Osman et al., 2025; Sun et al., 2023). Consumers are no longer seeking luxury in the form of opulent displays of wealth, but rather in solutions that allow them to live comfortably while reducing their environmental footprint (Nováková et al., 2019; Staniszewska et al., 2020; Żywiołek, Mathiyazhagan, et al., 2025; Żywiołek, Wolniak, et al., 2025). As individuals become more aware of the importance of managing their energy consumption at home, sustainable energy solutions such as solar panels, smart thermostats, and other energy-efficient technologies are gaining increasing popularity (Deja et al., 2023; Khan et al., 2025). These technologies not only promise long-term savings on energy bills but also contribute to the broader goal of environmental sustainability. The concept of ecoluxury is emerging, where luxury is defined not by extravagance but by the ability to enjoy a high-quality, environmentally responsible lifestyle. Energy management, therefore, plays a central role in shaping modern consumer behavior and organizational strategies, as businesses strive to offer products and solutions that align with the growing demand for sustainable and energy-efficient options (Duan et al., 2023; Ingaldi & Klimecka-Tatar, 2020).

This shift towards sustainability in consumer decision-making reflects a broader trend in society, where energy-efficient investments are viewed as both an economic and an ethical choice (Klimecka-Tatar, 2024; Thirakulwanich et al., 2025). Consumers are becoming more deliberate in their choices, investing in products and technologies that not only improve their quality of life but also reduce their ecological footprint (Lewis, 2015; Llewellyn et al., 2024; Nieminen et al., 2023). As a result, energy management technologies are now seen as a key element of modern luxury, blending innovation, comfort, and environmental responsibility (Guetlein et al., 2025; Khan et al., 2025; Klimecka-Tatar, 2024; Kuzior et al., 2022).

The objective of this study is to explore how consumers perceive the role of modern energy technologies within the context of sustainable living. Through a survey conducted among individuals and households utilizing energy-efficient technologies, the research aims to examine the factors that influence consumer decisions, including the economic and ecological aspects of adopting such technologies. By understanding the relationship between consumer attitudes, the perceived benefits of energy-efficient solutions, and their investment willingness, this study provides valuable insights into how sustainability is shaping contemporary notions of luxury. Ultimately, this research contributes to the broader discussion of how technological innovation and conscious consumption are redefining luxury in the context of the ongoing green transformation.

2. RRESEARCH METHODOLOGY

The purpose of this study is to analyze consumer attitudes and preferences regarding modern energy management technologies in households, taking into account the economic factor. The study aims to understand how respondents perceive energy-saving

technologies, their willingness to invest in these solutions, and the impact these technologies have on daily energy management in households.
The research has been conducted through an online questionnaire, which allowed access to a large group of respondents. Respondents have been selected using the purposive sampling method, which means that the research group was consist of individuals who are actively interested in sustainability, new technologies in homes, and energy management. The study has included respondents aged 18–65 who live in Poland and have experience with energy usage in households. The study is a pilot, preliminary study (only 70 respondents), but in the future, the research will aim to cover a broad demographic range, including various income levels and education backgrounds. This sample size is sufficient to obtain representative results and ensures the possibility of performing statistical analysis, as well as to indicate the direction of further research.
The questionnaire consists of 10 closed-ended questions, using a 5-point Likert scale, allowing respondents to rate their agreement with each statement. The Likert scale includes responses ranging from:
1 – Strongly disagree
2 – Disagree
3 – Neutral
4 – Agree
5 – Strongly agree
The questionnaire includes questions regarding:

- the use of modern energy management technologies (e.g., solar panels, smart devices),
- attitudes toward eco-friendly investments in the home,
- opinions on the economic benefits of energy-saving solutions,
- assessment of willingness to invest in energy management technologies.

Based on the obtained results, a basic statistical analysis has been carried out. Correlation analysis allows to check if there is a relationship between consumers' attitudes and their willingness to invest in energy-saving technologies. In this part of the research, the comparative analysis of variables such as income, age, and education level has not been conducted.

The questions to examine consumer attitudes towards these technologies, their willingness to invest in them, and how they perceive the savings associated with their use. The questions were as follow:

Q1. Investing in renewable energy sources (e.g., solar panels) in my home is cost-effective in the long term.
Q2. I am willing to pay more for devices that help me save energy if they lead to long-term savings.
Q3. I believe installing smart energy management systems (e.g., smart meters, thermostats) in my home reduces energy consumption costs.
Q4. Savings on energy bills are a major factor motivating me to invest in eco-friendly technologies at home.
Q5. I am aware that the initial investment in modern energy management technologies can pay off in lower operating costs.
Q6. I would like to invest in energy-efficient devices, but only if their price fits within my budget.

Q7. If the cost of installing solar panels or other renewable energy sources was comparable to traditional energy sources, I would consider installing them.
Q8. Using energy-saving technologies in my home allows me to achieve savings that I can allocate to other expenses.
Q9. I believe that energy management technologies, such as smart lighting and heating systems, are an investment that will bring financial benefits in the long term.
Q10. I am convinced that the savings from using renewable energy and energy-efficient devices outweigh the initial installation cost.

3. RESULTS AND DISCUSSION

The aim of the study was to understand consumer attitudes toward modern energy management technologies in households, as well as to assess their willingness to invest in eco-friendly solutions, taking into account the economic aspect. The research was based on a questionnaire that collected data on preferences regarding renewable energy, energy-efficient devices, and smart energy management systems. The analysis results, which will provide a better understanding of how respondents perceive these technologies and the factors that influence their investment decisions in the context of energy and savings. This study has explored the evolving concept of luxury in the context of sustainability, focusing on the increasing role of energy-efficient technologies and renewable energy sources in shaping consumer behavior.

In order to explore the relationship between the analyzed variables, a Pearson correlation analysis was performed. This method is appropriate for assessing the degree to which two continuous variables are linearly related.

The Pearson correlation coefficient (r) quantifies both the strength and direction of the linear relationship between variables. The coefficient can take values from -1 to 1 (1 indicate a strong positive correlation, -1 indicate a strong negative correlation, near 0 suggest little to no linear relationship).

To determine the statistical relevance of the results, p-values were calculated. A threshold of $p < 0.05$ was used to determine statistical significance. The analysis was conducted using Microsoft Excel. The results of statistical analysis have been presented in Table 1 (general statistical parameters) and Table 1 (correlation matrix).

Table 1
Statistical characteristics of the survey results

Parameter	*Q1*	*Q2*	*Q3*	*Q4*	*Q5*	*Q6*	*Q7*	*Q8*	*Q9*	*Q10*
Mean	4.16	2.29	3.93	4.11	3.03	4.20	2.29	3.17	4.16	1.96
Median	4.00	2.00	4.00	4.00	3.00	5.00	2.00	4.00	4.00	2.00
Standard Deviation	0.86	0.76	0.82	1.02	1.00	0.98	1.23	1.35	0.99	0.87
Sample Variance	0.74	0.58	0.68	1.06	1.01	0.97	1.54	1.85	1.00	0.77
Kurtosis	0.21	-0.37	0.27	-0.61	-0.49	-0.20	-0.69	-1.48	0.64	1.40
Skewness	-0.87	0.06	-0.67	-0.81	0.73	-0.98	0.60	-0.11	-1.13	1.02
Minimum	2.00	1.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00
Maximum	5.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

The data collected through the survey were analyzed and described using fundamental statistical measures. These included the mean, which indicates the average value; the median, representing the central tendency; the standard deviation and sample variance,

which reflect the variability of responses; as well as kurtosis and skewness, which provide insights into the shape of the distribution. Additionally, the minimum and maximum values were reported to show the full range of responses. This descriptive analysis allowed for a clearer understanding of the general trends and patterns present in the dataset (Table 2).

Table 2
The correlation matrix for the answers to the questions*.

	Q1	*Q2*	*Q3*	*Q4*	*Q5*	*Q6*	*Q7*	*Q8*	*Q9*	*Q10*
Q1	1									
Q2	0.063	1								
Q3	0.261	0.148	1							
Q4	0.519	0.179	0.284	1						
Q5	-0.005	-0.199	0.353	0.025	1					
Q6	-0.072	0.135	-0.179	-0.337	-0.356	1				
Q7	-0.300	-0.118	0.106	-0.117	0.283	-0.118	1			
Q8	0.224	0.133	0.024	0.203	-0.342	-0.015	-0.038	1		
Q9	-0.079	-0.022	-0.162	-0.186	-0.119	0.026	-0.153	0.554	1	
Q10	0.240	-0.068	0.419	0.247	0.347	-0.174	-0.055	-0.200	-0.257	1

∗ (Q1) Investing in renewable energy sources (e.g., solar panels) in my home is cost-effective in the long term. (Q2) I am willing to pay more for devices that help me save energy if they lead to long-term savings. (Q3) I believe installing smart energy management systems (e.g., smart meters, thermostats) in my home reduces energy consumption costs. (Q4) Savings on energy bills are a major factor motivating me to invest in eco-friendly technologies at home. (Q5) I am aware that the initial investment in modern energy management technologies can pay off in lower operating costs. (Q6) I would like to invest in energy-efficient devices, but only if their price fits within my budget. (Q7) If the cost of installing solar panels or other renewable energy sources was comparable to traditional energy sources, I would consider installing them. (Q8) Using energy-saving technologies in my home allows me to achieve savings that I can allocate to other expenses. (Q9) I believe that energy management technologies, such as smart lighting and heating systems, are an investment that will bring financial benefits in the long term. (10)Q10. I am convinced that the savings from using renewable energy and energy-efficient devices outweigh the initial installation cost

As shown in the data presented in Table 1, the questions posed in the study demonstrated both positive and negative correlations. The highest negative correlation coefficient was observed for the following questions (*r*- Pearson correlation):

$$Q5 \leftrightarrow Q6,\ r = -0.356 \quad (1)$$

This represents a weak negative correlation between the awareness of long-term cost savings from modern energy management technologies (Q5) and the willingness to invest in energy-efficient devices, provided they fit within the budget (Q6). It suggests that individuals who recognize the potential cost savings from energy management technologies might be somewhat less inclined to invest in energy-efficient devices if they perceive the cost as a financial burden.

$$Q5 \leftrightarrow Q8,\ r = -0.342 \quad (2)$$

There is a weak negative correlation between the awareness of cost-saving potential from energy management technologies (Q5) and the belief that using energy-saving technologies in the home leads to savings that can be used for other expenses (Q8). This implies that people who are aware of the cost-saving benefits of energy management systems might not always associate them with the ability to save money for other purposes.

$$Q4 \leftrightarrow Q6,\ r = -0.337 \tag{3}$$

A weak negative correlation exists between being motivated to invest in eco-friendly technologies due to savings on energy bills (Q4) and the willingness to purchase energy-efficient devices, as long as their price is within the budget (Q6). This indicates that those motivated by the savings on energy bills may feel somewhat reluctant to invest in energy-efficient devices unless they perceive them as affordable. Pearson correlation coefficient of -0.3 indicates a weak negative correlation between the two variables. This means that as one variable increases, the other tends to decrease, but the relationship is not strong. These correlations imply that individuals who are more inclined to see the financial benefits of energy management technologies are also more likely to invest in these solutions, supporting the idea of long-term savings as a motivating factor.
The highest positive correlation coefficient was observed for the following questions:

$$Q8 \leftrightarrow Q9,\ r = 0.554 \tag{4}$$

This indicates a moderate positive correlation between the belief that using energy-saving technologies in the home results in savings that can be redirected to other expenses (Q8) and the view that energy management technologies (such as smart lighting and heating systems) are a good investment with long-term financial benefits (Q9). In other words, those who perceive energy-saving technologies as a means to free up money for other uses are more likely to consider these technologies as a worthwhile investment that will provide financial returns over time.

$$Q1 \leftrightarrow Q4,\ r = 0.519 \tag{5}$$

The moderate positive correlation between the belief that investing in renewable energy sources (like solar panels) is cost-effective in the long term (Q1) and the idea that savings on energy bills are a key motivator for investing in eco-friendly technologies at home (Q4) suggests that individuals who recognize the long-term financial advantages of renewable energy are more likely to be motivated by potential savings on energy bills when considering home eco-friendly investments.

$$Q3 \leftrightarrow Q10,\ r = 0.419 \tag{6}$$

The moderate positive correlation between the belief that installing smart energy management systems (e.g., smart meters, thermostats) helps reduce energy consumption costs (Q3) and the conviction that the savings from using renewable energy and energy-efficient devices outweigh the initial installation cost (Q10) suggests that individuals who believe that smart energy management systems contribute to reducing

costs are also more likely to view the long-term savings from energy-efficient solutions as justifying their upfront investment.

A Pearson correlation coefficient greater than 0.5 indicates a moderate to strong positive correlation between two variables. This means there is a noticeable tendency for an increase in one variable to be associated with an increase in the other. These results show that the variables are positively correlated, meaning that as one factor increases, so does the other.

These correlations imply that people who see energy-saving technologies and renewable energy investments as cost-effective tend to be more motivated by the prospect of energy bill savings and view these technologies as valuable investments with long-term financial returns. Similarly, individuals who believe that smart energy management technologies help reduce costs are more inclined to think that the long-term savings from energy-efficient devices outweigh their initial installation costs.

The findings indicate that consumers associate modern luxury with energy-efficient technologies, smart energy management systems, and renewable energy sources. They view these technologies as not only contributing to a more sustainable lifestyle but also offering practical advantages such as cost savings and enhanced living comfort. These insights emphasize the growing importance of integrating sustainability into everyday living, where technological innovation becomes an integral part of both environmental and economic considerations.

Importantly, this research introduces a new conceptual framework for understanding luxury in the modern age ecoluxury. The authors propose ecoluxury as a definition that blends the traditional notions of luxury with ecological responsibility, where sustainability and technological innovation are seen as essential elements of a high-quality lifestyle. This new definition emphasizes the intersection of comfort, prestige, and environmental consciousness, presenting ecoluxury as a paradigm that reflects the ongoing green transformation of society.

In summary, the study highlights a fundamental shift in consumer values, where the pursuit of luxury is increasingly intertwined with ecological awareness and a commitment to sustainable practices. By introducing the concept of ecoluxury, the authors provide a new lens through which to view the future of luxury in a world that is becoming ever more focused on environmental sustainability. As such, ecoluxury is poised to become a defining feature of modern consumerism, driving innovation and shaping the way we define and experience luxury in the years to come.

Based on the conducted research and the results obtained, the following definition of ecoluxury can be proposed:

Ecoluxury is a contemporary form of luxury that emerges at the intersection of quality of life, prestige, ecological responsibility, and economic rationality. It is grounded in a conscious lifestyle in which modern energy-efficient technologies, renewable energy sources, and intelligent energy management systems play a central role. The study's findings indicate that, for consumers, luxury is no longer associated with excess but based on conscious consumer choices, investment in modern energy-efficient technologies, and the use of renewable energy sources. It represents a lifestyle that promotes quality, innovation, and environmental care, treating ecological sustainability as an essential component of modern luxury.

4. CONCLUSION

The correlations suggest that people who recognize the financial benefits of energy management technologies are more likely to invest in these solutions, highlighting the role of long-term savings as a key motivating factor. Additionally, those who view energy-saving and renewable energy technologies as cost-effective are generally more driven by the potential savings on energy bills and consider these technologies valuable for long-term financial gains. Likewise, individuals who believe that smart energy management systems reduce costs tend to agree that the long-term savings from energy-efficient devices justify their initial installation costs. Based on the presented data, the following conclusions can be drawn:

- Long-term savings motivate investment: Individuals who recognize the financial benefits of energy management technologies are more likely to invest in them, with long-term savings being a key motivator.
- Cost-effectiveness drives eco-friendly investments: People who see energy-saving and renewable energy technologies as cost-effective are more motivated by potential energy bill savings and view these technologies as valuable long-term investments.
- Smart energy systems support financial justification: Those who believe smart energy management systems reduce costs are more inclined to think that the long-term savings from energy-efficient devices outweigh their initial installation costs.

These findings suggest that consumers who value both financial savings and environmental benefits are more likely to invest in products or technologies that align with the principles of ecoluxury, where the luxury experience is combined with sustainable and energy-efficient solutions.

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