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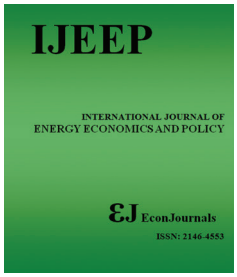

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Energy Efficiency Measures in Public Sector: An Empirical Analysis of the Determinants of Adoption of Low-cost Energy Efficiency

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ABSTRACT

This research delves into the intricate interplay between leadership styles, eco-innovation, and energy efficiency in the Indonesian public sector, examining the roles of green transformational leadership and ethical leadership. Acknowledging the pivotal role of public sector institutions in fostering sustainable practices, the study addresses the ongoing debate surrounding the efficacy of these leadership styles in the context of eco-innovation and energy efficiency. Using a quantitative research approach, data was collected from 227 faculty members across various Indonesian public sector institutions through a questionnaire. SmartPLS 4 software was employed for data analysis. The findings reveal that green transformational leadership positively influences eco-innovation, yet it does not directly impact energy efficiency. Conversely, ethical leadership does not directly drive eco-innovation but demonstrates a positive association with energy efficiency. Eco-innovation emerges as a direct contributor to energy efficiency. Significantly, the research identifies eco-innovation as a mediator between green transformational leadership and energy efficiency. However, this mediating effect is not observed in the relationship between ethical leadership and energy efficiency. The study underscores the need for leadership emphasizing environmental consciousness and ethics, coupled with the promotion of eco-innovation, to effectively attain sustainability and energy efficiency objectives within the Indonesian public sector.

Keywords: Green Transformational Leadership, Ethical Leadership, Energy Efficiency, Public Sector.
JEL Classifications: B22, F38, H21, G21, G32, G33

1. INTRODUCTION

Amidst global uncertainties and escalating environmental challenges, the central role of public sector institutions in national development cannot be overstated. These entities serve as pivotal hubs for research, innovation, and various aspects of societal well-being (Chankseliani and McCowan, 2021; Žalėnienė and Pereira, 2021). However, the trajectory of the public sector's future confronts a myriad of challenges, demanding strategic interventions. Foremost among these challenges is the imperative to enhance global competitiveness and address accessibility issues, particularly in remote areas and for socioeconomically disadvantaged groups (Heleta and Bagus, 2021). Additionally, as public sector institutions grapple with their role in fostering research and innovation, there is a growing recognition of the significance of addressing sustainability and environmental concerns. In this context, the integration of energy efficiency measures becomes exceptionally crucial, exerting a profound impact on various facets of public sector operations (Owens, 2017; Elmassah et al., 2022). As the public sector navigates the

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complexities of the contemporary landscape, it must address the diverse challenges posed by accessibility and environmental sustainability, with a specific focus on enhancing energy efficiency. Effectively addressing these challenges ensures that public sector institutions remain not only relevant but also resilient contributors to comprehensive national development agendas.

Public sector institutions, recognized as substantial consumers of energy in their operational activities (Ferguson and Roofe, 2020), play a pivotal role in adopting energy-efficient practices that offer diverse benefits. The implementation of these measures enables institutions to conserve resources, reduce operational costs, and allocate resources more effectively. Additionally, embracing energy-efficient practices aligns with broader environmental protection initiatives, contributing to the reduction of energy consumption and carbon footprints (Iddio et al., 2020; Mendoza et al., 2019; Li et al., 2021). This not only supports global sustainability efforts but also aids in mitigating the adverse impacts of climate change (Chowdhury and Hossain, 2021). Beyond environmental stewardship, energy efficiency is crucial for ensuring compliance with rigorous environmental regulations and standards, safeguarding the reputation of public sector institutions. Adherence to these standards is essential for maintaining credibility and trust. Recognizing their influential role, public sector institutions extend their impact beyond internal practices by serving as platforms for raising awareness about the significance of energy efficiency and promoting the development of green technologies. Moreover, these institutions act as innovation hubs, driving research initiatives in renewable energy (Pham et al., 2023). The positive effects of energy efficiency extend beyond institutional boundaries, creating a conducive environment and enhancing the overall quality of surroundings. Furthermore, the commitment to energy efficiency enhances the competitiveness and reputation of public sector institutions, both at the national and international levels (Bahzar, 2019; Singh et al., 2020). In essence, energy efficiency emerges as a cornerstone for public sector institutions, fostering sustainability, compliance, and global competitiveness.

Public sector institutions face challenges in efficiently managing energy resources due to high energy consumption and a lack of awareness regarding the importance of energy efficiency (Nižetić et al., 2019; Chankseliani and McCowan, 2021). Some institutions, following environmentally unfriendly policies and practices, experience negative consequences on their surroundings. The pressure of increasingly stringent environmental regulations and public demands for sustainable practices necessitates public sector institutions to adhere to higher energy and environmental standards (Shafiei and Maleksaeidi, 2020; Wang et al., 2021). The rapid growth of the public sector in Indonesia, marked by the expansion of facilities and technology use, has intensified the demand for energy efficiency. This situation calls for a cultural shift and leadership oriented toward sustainability (Leal Filho et al., 2019). Implementing green transformational leadership and ethical leadership becomes crucial for public sector institutions to initiate organizational culture change, raise awareness about the importance of energy efficiency, and integrate green practices into their operations. This not only enhances energy efficiency but also aligns with environmental protection efforts and contributes to upholding the institutions' reputations in an increasingly competitive public sector landscape (Iddio et al., 2020; Žalėnienė and Pereira, 2021).

Organizations benefit significantly from leaders exhibiting green transformational leadership, achieving higher levels of energy efficiency, as noted by Zhang et al. (2020). Leaders who prioritize sustainability and environmental values tend to inspire staff and stakeholders to adopt energy-efficient practices. Additionally, Cui et al. (2023) highlight that both green transformational and ethical leadership can enhance environmental awareness, with leaders effectively communicating the importance of social and environmental responsibility inspiring positive actions related to energy efficiency and green practices (Bahzar, 2019). Despite leaders' good intentions, the implementation of energy-efficient practices often encounters technical, budgetary, and cultural barriers, as highlighted by Leal Filho et al. (2019). Building upon this existing literature, this study delves into the relationship between sustainability and ethics-oriented leadership styles and efforts to improve energy efficiency in the public sector. Specifically focusing on the Indonesian public sector, the research aims to analyze the extent to which green transformational leadership, ethical leadership, and eco-innovation influence energy efficiency. Examining these factors in the context of the public sector will provide valuable insights into overcoming barriers and fostering a more energy-efficient and environmentally conscious organizational culture.

2. LITERATURE REVIEW

2.1. Green Transformational Leadership and Energy Efficiency

Green transformational leadership, centered on inspiring positive and sustainable changes in organizational culture, particularly in environmentally friendly practices, offers significant advantages in the public sector (Rizvi and Garg, 2021). Leaders adopting this approach have the capacity to motivate staff and stakeholders, fostering active participation in energy efficiency endeavors, the utilization of renewable energy, and heightened environmental awareness. This cultivates an organizational structure conducive to innovation and sustainable practices (Çop et al., 2021; Singh et al., 2020). Green transformational leadership integrates the principles of transformational leadership with a focus on sustainability and eco-friendly practices (Al-Zawahreh et al., 2019). This leadership approach emphasizes innovation, positive change, and individual development, placing specific emphasis on environmental responsibility. Leaders who adopt green transformational leadership, as highlighted by Begum et al. (2022), actively contribute to a shift in the organizational culture towards more environmentally friendly practices. This includes promoting energy efficiency, the utilization of renewable energy sources, and minimizing environmental impact. Moreover, green transformational leadership fosters environmental awareness among organizational members and sets an example in sustainable practices (Zhang et al., 2020). Ultimately, this leadership style seeks to align organizational goals with the principles of environmental sustainability (Singh et al., 2020; Elmassah et al., 2022).

In the business and organizational context, effective leadership is acknowledged as a critical factor in fostering creativity and innovation. Competent leaders serve as pivotal resources in organizational development and play a crucial role in ensuring the sustainability of a company. Li et al. (2020) emphasize the significance of responsible leadership, highlighting that leaders with a commitment to environmental responsibility play a crucial role in addressing ecological damage and its potential impact on organizations. Additionally, Jamali et al. (2022) delve into the impact of transformational and authentic leadership on both product and process innovation. Green transformational leadership, specifically oriented towards sustainability, emerges as a key influencer of institutional innovation capacity. This suggests that leaders with a sustainability orientation can significantly contribute to driving innovation within organizations. Therefore, the research hypothesis is formulated as follows:

Hypothesis 1. Green transformational leadership has a significant effect on eco-innovation

Hypothesis 2. Green transformational leadership has a significant effect on energy efficiency

2.2. Ethical Leadership and Energy Efficiency

Ethical leadership is an approach wherein leaders prioritize ethical and moral principles in their decision-making and actions, acting with integrity, honesty, and fairness (Srivastava et al., 2020). This leadership style involves a commitment to respecting individual rights, exercising wisdom in leadership duties, and taking responsibility for the impact of decisions on all stakeholders, including society and the environment (Vikaraman et al., 2021; Sabir, 2021). Ethical leaders cultivate a work environment that fosters integrity, wisdom, sustainability, and endeavors to minimize moral conflicts. The goal is to establish organizations that not only thrive in business but also operate with high ethical standards (Smith and Kouchaki, 2021). Within this ethical leadership approach, organizational members are empowered to think creatively and generate innovative solutions that align with sustainable practices. Moreover, ethical leadership underscores the importance of environmental responsibility and promotes ethical values among organizational members (Carayannis and Morawska-Jancelewicz, 2022). This motivation leads teams to develop innovations that support eco-innovation, create environmentally friendly products or services, and reduce environmental impact. Ethical leaders can also influence organizational policies to support sustainable practices, including energy efficiency (Begum et al., 2022; Rizvi and Garg, 2021).

Ethical leadership, emphasizes the moral and ethical dimensions of a leader's decision-making and actions. Ethical leaders, as highlighted by Nguyen et al. (2021), play a pivotal role in communicating the importance of social and environmental responsibility. Implementing both green transformational and ethical leadership in the public sector creates an organizational culture that prioritizes environmental concerns and energy efficiency. This, in turn, drives sustainable practices, raises environmental awareness, and reduces energy consumption. Furthermore, the adoption of these leadership approaches enhances the institution's reputation, showcasing a commitment to sustainability and a positive environmental impact. In the long term, this commitment translates into significant financial, environmental, and social benefits for the public sector institution and the broader community (Khan et al., 2019; Ferguson and Roofe, 2020; Ofor-Douglas, 2023). Integrating green transformational and ethical leadership in the public sector emerges as a strategic approach to foster sustainability, environmental responsibility, and positive societal impact. As noted by Srivastava et al. (2020), leaders with an ethical orientation contribute to creating an environment where employees are motivated to think creatively and devise solutions that align with ethical goals and sustainable practices. The substantial impact of ethical leadership on employee creativity becomes evident, as demonstrated by research findings from Wen et al. (2021), who reveal a positive influence on enhancing employee voice behavior, subsequently increasing creativity levels. Furthermore, the research findings highlight the positive moderating role of eco-innovation in strengthening the relationship between voice behavior and employee creativity. This suggests that, when organizations adopt sustainable innovations, the impact of ethical leadership on employee creativity can be further amplified. Therefore, the hypotheses in this study are summarized as follows:

Hypothesis 3. Ethical leadership has a significant effect on eco-innovation

Hypothesis 4. Ethical leadership has a significant effect on energy efficiency

2.3. Eco-Innovation and Energy Efficiency

Eco-innovation embodies an organizational commitment to developing products, services, or business processes with a heightened emphasis on minimizing environmental impact (Yurdakul and Kazan, 2020). To achieve this objective, organizations delve into the creation of innovative solutions that prioritize environmental friendliness. This can involve adopting resource-efficient technology, utilizing recyclable materials, or implementing production methods that result in lower carbon emissions. Beyond the primary goal of reducing adverse environmental effects, eco-innovation also seeks to generate added value by creating a competitive advantage in the market (Bahzar, 2019). Eco-innovation practices extend beyond environmental impact reduction and play a pivotal role in fostering energy efficiency. By designing solutions that are inherently more energy-efficient, organizations, as highlighted by Saif et al. (2023), can significantly decrease energy consumption. This dual achievement not only contributes to mitigating environmental impact but also results in tangible reductions in operational costs. Moreover, the adoption of eco-innovation practices cultivates a culture of sustainable innovation within organizations. This, as emphasized by Heleta and Bagus (2021) and Pham et al. (2023), contributes to the creation of a greener and more sustainable work environment. Consequently, organizations embracing eco-innovation practices not only benefit the environment and reduce operational costs but also position themselves as leaders in fostering sustainable and environmentally conscious workplaces.

Sahoo et al. (2023) highlight the imperative for environmentally friendly technologies, advocating for systematic and incremental ecological innovation as crucial for maximizing resource efficiency and achieving sustainable growth. Moreover, Begum et al. (2022)

present compelling evidence of the positive impact of eco-innovation on the development of energy-efficient technologies, emphasizing the pivotal role of sustainable innovation in advancing more energy-efficient technologies. This sentiment is echoed by Zhang et al. (2020), who assert that green innovation serves as a key factor in reducing energy intensity in the industrial sector. Recognizing the significant economic impacts of energy and creativity, as stated by Jamali et al. (2002), the development of more energy-efficient technologies, propelled by sustainable innovation, assumes a crucial role in curbing inefficient energy consumption. Based on this literature, the following hypotheses are proposed in this research:

Hypothesis 5. Eco-innovation has a significant effect on energy efficiency

Hypothesis 6. Eco-innovation mediates the relationship between green transformational leadership and energy efficiency

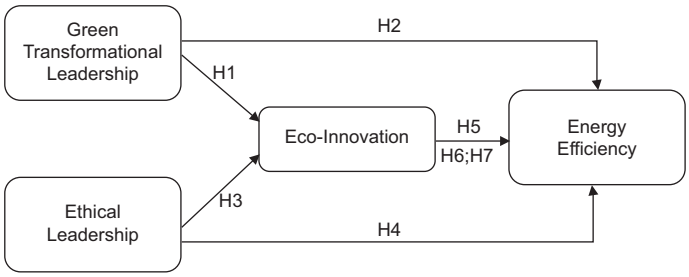
Hypothesis 7. Eco-innovation mediates the relationship between ethical leadership and energy efficiency

3. RESEARCH METHODS

This research employs a quantitative research method to investigate the relationships among key variables within public sector agencies in West Java. The independent variables tested include green transformational leadership and ethical leadership, while eco-innovation is examined as both an independent and mediating variable (Figure 1). Energy efficiency is the dependent variable under scrutiny. Primary data for the study were collected through a questionnaire utilizing a Likert scale ranging from 1 to 7 points. The questionnaire sought assessments from respondents on the variables of interest.

The study focused on employees from various public sector agencies in West Java as research participants, with a total of 300 questionnaires distributed online. Ultimately, 227 questionnaires were used for analysis after excluding 11 incomplete responses. The sample selection employed a purposive sampling technique, specifically choosing respondents with knowledge and experience relevant to green transformational leadership, ethical leadership, eco-innovation, and energy efficiency within the public sector agencies of West Java. To scrutinize the research hypotheses, the collected data underwent analysis using SmartPLS 4 software. This methodological approach ensures a robust examination of the relationships between green transformational leadership, ethical leadership, eco-innovation, and energy efficiency within the specific context of public sector agencies in West Java.

Figure 1: Model framework



4. RESEARCH RESULTS

The initial phase of testing involves the evaluation of indicators utilized for the measurement of latent variables, considering standard loading factor values, reliability, and validity of each indicator variable. Preliminary testing is a crucial step preceding hypothesis testing, aiming to ensure the precision and appropriateness of the variables to be examined. The loading factor test is conducted to verify the relevance of the indicators employed in measuring the latent variable. A predetermined acceptable threshold for the loading factor of indicators is established at 0.6. If the loading factor value exceeds 0.6, the indicator is deemed relevant for measuring the latent variable. Conversely, if the loading factor value obtained for an indicator falls below 0.6, the indicator lacks sufficient relevance in measuring the latent variable. Consequently, latent variables exhibiting low loading factor values may be considered for elimination from the analysis to enhance result accuracy. The outcomes of the loading factor test are presented in Figure 2 and Table 1.

In this study, the variables green transformational leadership, ethical leadership, and eco-innovation are measured using four indicators each, while the variable energy efficiency is measured using three indicators. The results of the loading factor test in the table above show that all values of the latent variable indicators exceed 0.6. For the indicators used to measure the green transformational leadership variable, the standard loading factor values obtained are GTL1 (0.894), GTL2 (0.914), GTL3 (0.906), GTL4 (0.818). In measuring the ethical leadership variable, the standard loading factor values for the indicators are EL1 (0.881), EL2 (0.799), EL3 (0.805), EL4 (0.921). Furthermore, the standard loading factor values for the indicators measuring the eco-innovation variable are EI1 (0.800), EI2 (0.763), EI3 (0.859), EI4 (0.883). As for the indicators measuring the energy efficiency variable, the standard loading factor values are EE1 (0.771), EE2 (0.916), EE3 (0.881). Based on the loading factor test results for each indicator, it can be concluded that each indicator in this study is relevant in measuring the latent variables.

The next analysis involves reliability testing and validity testing. Reliability testing is used to demonstrate the reliability and consistency of the indicators representing the questionnaire in measuring latent variables. In reliability testing, the Cronbach's alpha value measures the lower bound of the reliability of a construct, and the composite reliability measures the actual reliability of a construct. To achieve good reliability, the threshold value for Cronbach's alpha should be >0.7. Additionally, the composite reliability (CR) value should also be >0.7. Furthermore, validity testing is used to measure the validity of the indicators representing the questionnaire used to measure latent variables. In validity testing, the indicators measuring latent variables should have an average variance extract (AVE) >0.6 to achieve convergent validity.

The results of reliability and validity testing, as presented in Table 2, show that the variable green transformational leadership obtained a Cronbach's alpha value of 0.906, a CR of 0.909, and an AVE of 0.781. The Cronbach's alpha and CR values obtained for the green transformational leadership variable are above 0.7,

Figure 2: Analysis Graph

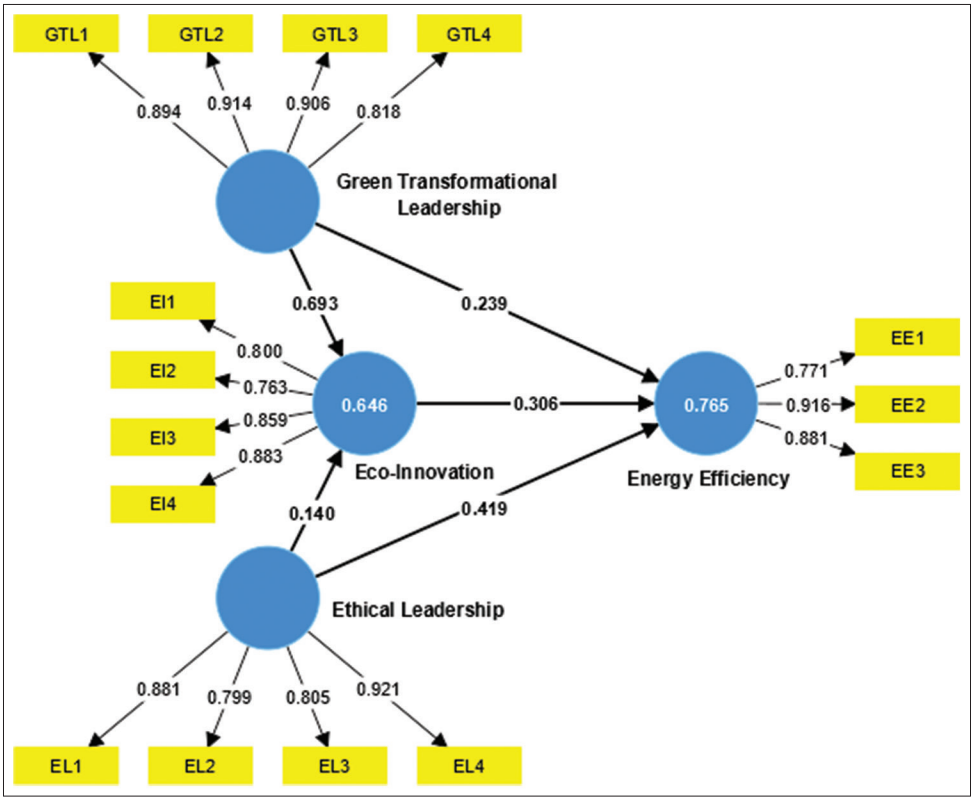


Table 1: Standard loading factors

Variable	Indicator	Std. Loading Factor
Green Transformational Leadership	GTL1	0.894
	GTL2	0.914
	GTL3	0.906
	GTL4	0.818
Ethical Leadership	EL1	0.881
	EL2	0.799
	EL3	0.805
	EL4	0.921
Eco-Innovation	EI1	0.800
	EI2	0.763
	EI3	0.859
	EI4	0.883
Energy Efficiency	EE1	0.771
	EE2	0.916
	EE3	0.881

indicating that the variable is reliable. Furthermore, the AVE value obtained for the green transformational leadership variable is also >0.6, indicating the validity of the variable. Moreover, for the ethical leadership variable, the Cronbach's alpha value obtained is 0.874 (>0.7), CR is 0.878 (>0.7), and the AVE is 0.728 (>0.6). The values of reliability and validity testing obtained for the ethical leadership variable indicate that the variable is both reliable and valid. Additionally, in the reliability testing of the eco-innovation variable, a Cronbach's alpha value of 0.847 and a CR of 0.866 were obtained. These values are above the accepted threshold, which is >0.7, indicating the reliability of the eco-innovation variable. As for the validity testing, the eco-innovation variable obtained an AVE value of 0.687 (>0.6), signifying that the validity of the eco-innovation variable is accepted. Furthermore, the energy efficiency variable, in reliability testing, obtained a Cronbach's alpha value of 0.820 and a CR of 0.841. These values are >0.7, indicating that the energy efficiency variable is reliable. In the validity testing, the AVE value obtained is 0.737. This value is >0.6, signifying that the energy efficiency variable is both valid and reliable.

In testing the validity of the indicators representing the questionnaire, this study also conducted a discriminant validity test, which aims to demonstrate that the instruments used can effectively distinguish between the variable being measured and other variables. Discriminant validity is considered good when the indicator values obtained for measuring the latent variable are higher than those for other variables. In this study, discriminant validity was assessed using cross-loading, which tested the indicators used to measure the latent variables in detail. Table 3 shows that the results of the discriminant validity test indicate that the indicators used are effective in measuring the latent variables. This means that discriminant validity testing in this study is accepted because the values obtained for all indicators (marked in bold) are higher than the correlations between the indicators and other latent variables.

Furthermore, once the indicators used in this study have proven to be reliable, hypothesis testing is carried out to examine the influence between variables. This ultimately answers the hypotheses proposed in this research – whether they can be accepted or rejected. In this study, there are a total of 7 (seven) hypotheses to be tested, with 5 (five) hypotheses being tested for their direct effects, while the other 2 (two) hypotheses are tested for their indirect effects using mediating variables. Hypotheses can be accepted if the T-statistics obtained are >1.96 or if the P-value obtained is <0.05. The results of hypothesis testing in this study are presented in Table 4.

Table 2: Reliability and validity

Variable	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
Green Transformational Leadership	0.906	0.909	0.781
Ethical Leadership	0.874	0.878	0.728
Eco-Innovation	0.847	0.866	0.685
Energy Efficiency	0.820	0.841	0.737

Table 3: Discriminant validity (cross loading)

Variable	Green Transformational Leadership	Ethical Leadership	Eco-Innovation	Energy Efficiency
GTL1	0.894	0.643	0.778	0.751
GTL2	0.914	0.695	0.710	0.698
GTL3	0.906	0.689	0.681	0.700
GTL4	0.818	0.655	0.645	0.678
EL1	0.706	0.881	0.639	0.728
EL2	0.617	0.799	0.577	0.647
EL3	0.655	0.805	0.513	0.646
EL4	0.604	0.921	0.530	0.714
EI1	0.666	0.526	0.800	0.596
EI2	0.505	0.332	0.763	0.486
EI3	0.731	0.698	0.859	0.759
EI4	0.706	0.578	0.883	0.680
EE1	0.510	0.662	0.528	0.771
EE2	0.833	0.740	0.761	0.916
EE3	0.686	0.667	0.686	0.881

Table 4: Hypothesis test

Hypothesis		T statistics	P-values	Information
H1	Green Transformational Leadership -> Eco-Innovation	8.042	0.000	Significant
H2	Green Transformational Leadership -> Energy Efficiency	1.514	0.130	Not Significant
H3	Ethical Leadership -> Eco-Innovation	1.609	0.108	Not Significant
H4	Ethical Leadership -> Energy Efficiency	2.897	0.004	Significant
H5	Eco-Innovation -> Energy Efficiency	2.608	0.009	Significant
H6	Green Transformational Leadership -> Eco-Innovation -> Energy Efficiency	2.652	0.008	Significant
H7	Ethical Leadership -> Eco-Innovation -> Energy Efficiency	1.354	0.176	Not Significant

The results of the first hypothesis testing indicate that the influence of green transformational leadership on eco-innovation is significant, with a T-statistics value of 8.042 (>1.96) and a P-value of 0.000 (< 0.05). Therefore, the first hypothesis of this study is accepted. However, in the second hypothesis, which examines the influence of green transformational leadership on energy efficiency, the T-statistics value is 1.514, and the P-value is 0.130. These results suggest that the second hypothesis is rejected as the T-statistics value is below 1.96, and the P-value exceeds 0.05. Furthermore, the third hypothesis, testing the influence of ethical leadership on eco-innovation, is also rejected. This is due to the T-statistics value of 1.609 and a P-value of 0.108. Conversely, the fourth hypothesis, examining the impact of ethical leadership on energy efficiency, is accepted with a T-statistics value of 2.897 (>1.96) and a P-value of 0.004 (<0.05). The fifth hypothesis, which explores the influence of eco-innovation on energy efficiency, obtains a T-statistics value of 2.608 (>1.96) and a P-value of 0.009 (<0.05). Therefore, the fifth hypothesis is accepted. Subsequently, in the sixth hypothesis, which suggests that eco-innovation mediates the relationship between green transformational leadership and energy efficiency, a T-statistics value of 2.652 (>1.96) with a P-value of 0.008 (<0.05) is obtained. Thus, it is concluded that eco-innovation can serve as a suitable mediating factor in the relationship between green transformational leadership and energy efficiency. However, in the seventh hypothesis, which posits that eco-innovation mediates the relationship between ethical leadership and energy efficiency, the T-statistics value is 1.354, and the P-value is 0.176. Consequently, the seventh hypothesis of this study is rejected because the T statistic and P-value obtained fall below the predefined thresholds.

5. CONCLUSION

The outcomes of this study present a nuanced perspective on the influence of leadership and ecological innovation on achieving energy efficiency in Indonesian public sector agencies. A notable finding is that green transformational leadership positively impacts eco-innovation but doesn't directly contribute to energy efficiency. This implies that while transformational leadership fosters ecological innovation within an organization, its connection to energy efficiency remains less conclusive. Conversely, ethical leadership in this study may not directly stimulate eco-innovation, but it does positively affect energy efficiency. This suggests a closer association between ethical leadership and energy efficiency practices rather than ecological innovation.

Furthermore, the study underscores the critical role of eco-innovation in influencing energy efficiency within public sector agencies. The results indicate that eco-innovation acts as a

significant mediator, linking green transformational leadership with energy efficiency. This underscores the pivotal role of ecological innovation in translating transformational leadership practices, emphasizing eco-friendly initiatives, into tangible gains in energy efficiency. However, eco-innovation doesn't play a similar mediating role in the relationship between ethical leadership and energy efficiency. This suggests that ethical leadership directly influences energy efficiency without relying on an intermediary like ecological innovation.

The implications of these findings for Indonesian public sector agencies highlight the importance of reinforcing environmentally and ethically oriented leadership practices while promoting ecological innovation to attain sustainability and energy efficiency objectives. In the context of environmental challenges and sustainability, the roles of leadership and innovation in efficient energy resource management become increasingly pivotal within public sector agencies.

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