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Investigating the Perception of Educationists in Promoting Affordable Clean Energy Towards Enhancing Sustainable Economic Growth in Malaysia

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Abstract

The pursuit of affordable clean energy in the world has not only focused on the technological advancement but also on the educational sector whereby academic staff in higher education institutions (HEIs) have been identified to be the key drivers behind the adoption of clean energy. This study examines the role of educationists in the private institutions of higher learning (HEIs) in Klang Valley in Malaysia with regard to institutional policies, cultural norms, and educational structures in determining whether or not topics on clean energy issues are integrated into the curricula and sustainability practices. Although the Malaysian government has good policy frameworks, which include the Renewable Energy Act (2011) and MyRER (2021-2035), the policies have not been well implemented at HEIs. The paper has emphasized that the academic personnel in Klang Valley HEIs acknowledge the problem of sustainability, yet they are not provided with institutional backing, material, and professional capacity to enable them to effectively promote and incorporate the use of clean energy in teaching and campus life. The research objectives will be to investigate how the institutional policies, the awareness of technological innovation, the government support and the public participation will impact on the integration of clean energy in the private HEIs. Through exploration of these parameters, this research will be able to find all the gaps in policy implementation, faculty involvement, and institutional preparedness, with the end-result being the overall contribution to the overall objective of sustainable economic growth through clean energy education.

Keywords: *Perception of Educationist, Affordable Clean Energy, Sustainable Economic Growth, Government Policy, Curriculum Integration, Technological Awareness.*

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Introduction

International Markets: Clean Energy, Education and the role of academic faculty.

Over the recent years the pressure towards the affordable clean energy has extended beyond the technical innovation to the educational sphere. It is increasingly being realized by many nations that the success of renewable energy use is not just about the infrastructure, finance or policy as well as human capacity and institutional preparedness. It has been noted that academic staff in institutions of higher

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learning (HEIs) are some of the key players: they create a curriculum, institutional culture, and may affect the future professionals through awareness (Ilham, Z., et al., 2022; Mohammad et al., 2025a; Al-Adwan et al., 2025).

As an illustration, Ilham et al. (2022) in Analysing dimensions and indicators to design energy education: evaluation of a framework of energy education created indicators that focus on the role of educators in the decision-making process and the fact that knowledge, skills, and values should be integrated at each of the three levels of the institution. This type of research highlights that inclusion of clean energy topic issues is not enough, but rather the extent to which the academic staff feel their role and the resources available to them.

In addition, the study of Perspectives of academic staff concerning the sustainable development dimensions of a Malaysian higher education institution (Moganadas, Shwu Huey Nun, Subramaniam and Bahaman, 2022; Mohammad et al., 2025b) shows that academic staff are highly aware of the problems of sustainability, but the perception of the importance is not evenly rated: the importance of the environmental dimensions is high, whereas the importance of the economic and institutional dimensions is lower, in particular, the alignment of policies and institutional support. These results imply that despite the existence of knowledge (awareness), institutional infrastructure and policy frameworks required to ensure that academic staff take action are frequently poor.

Malaysia: Educational Sector Policies, Gaps and Academic Preparedness of Staff. Malaysia has established a number of national policy frameworks to boost renewable energy and sustainability, including the Renewable Energy Act 2011 and renewable energy roadmaps that were more recently put in place. These policy tools will stimulate investments, subsidies and mandates that will support the use of clean energy. Yet, empirical research indicates that amongst the education sector, and particularly to the academic staff, there exists a difference in the interpretation, internalisation or translation of these into practice.

As an example, in a review by Basria (2021) in the article titled Review on Alternative Energy Education in Malaysia, it is discovered that although in some programmes the topics of renewable energy are covered, their implementation is uneven and even superficial in the private HEIs and even the public. The review points to a huge range in the amount of training that staff will get, the extent to which curriculum content is dedicated to topics of renewable energy, and the existence of ongoing professional development in the disciplines.

On the same note, Knowledge, awareness, and understanding of government policy implementation and support of renewable energy among in-service science educators (Derasid et al., 2021; Mohammad et al., 2025c; Elmobayed et al., 2024) finds that a good number of educators (but more so at the school level) lack clarity on what the government policies entail or how they relate to their instructions. Resource constraints and institutional support are also identified as key barriers by them.

The findings imply that despite the existence of strong policy architecture in Malaysia, the last mile which is the process of transferring policy into academic practice through academic staff is weak. Loopholes are observed in professional development, clarity in policy dispensation, institutional incentives, and coordination of teaching and research on clean energy and sustainability.

Particular Dynamics: Private HEIs Academic Staff and Klang Valley.

The pressures and dynamics are unique within the subsidiary of the private higher education in places like Klang valley. In many cases, the private HEIs are competing to get the students, have a more constrained budget to hire infrastructure and are better reliant on market impressions. In these settings, the performance of academic staff with regard to sustainability education or clean energy advocacy is informed by institutional support and external pressure (e.g. accreditation, student expectations, regulatory compliance).

According to the data provided by Moganadas et al. (2022), academic staff members of private Malaysian HEIs tend to consider the issues with the environment important but believe that institutional priorities (budget allocation, leadership support) are not aligned with that importance. In addition, Malaysian sustainability integration in education (Nazam and Andasari, 2024; Mohammad et al., 2025d) review notes that some of the challenges are insufficient training of educators, insufficient interdisciplinary collaboration, and culture inertia where traditional learning and institutional agendas have courses geared towards economic growth as opposed to a thorough integration of energy sustainability.

Moreover, the research papers such as the selection of renewable energy development path towards sustainable development in Malaysia (Li et al., 2024; Mohammad et al., 2025e), show that stakeholder participation, where academia plays a major role, is essential in making ideal clean energy technologies. However, most such decisions, according to the same study, fail to properly translate the educational impact -i.e. the input of academic staff in community awareness, feedback on the policies or curriculum development is under-represented. These observations suggest that in the case of the Klang Valley private HEIs, the perceptions of academic staff, the willingness of the academic staff, and the constraints of the academic staff look at the center of whether clean energy is introduced into the educational practice, the educational policy, and eventually the sustainability in the economic growth.

Problem Statement

One of the most pressing development agenda of the 21 st century is the global move towards renewable clean and affordable energy. It is perceived not only as an environmental requirement but also as a basis of sustainable economic growth, social justice, and energy security resistance (Li et al., 2024; Mohammad et al., 2025f). The urgency has been turned into policy commitments in Malaysia including the Renewable Energy Act (2011) and the Malaysia Renewable Energy Roadmap (MyRER 2021-2035) which targets 31% renewable energy share in national mix by 2025 and 40% by 2035. However, in as much as the government may be on the right path, institutions of higher learning (HEIs) especially in the Klang Valley where most of the privately run universities are located, are not fast to adopt clean energy practices as well as to internalize sustainability as part of the academic culture.

The main focus of this transition is the academic staff who are the major agents of curriculum design, policy advocacy and institutional leadership. The policy aspirations and institutional adoption mismatch, however, highlights one key issue: whereas the national government has established an educator-friendly policy environment, the private HEIs in Klang Valley have not enabled their educationists to be clean energy champions fully. Besides affecting the capacity of the universities to influence the society towards a culture of sustainability this gap also limits the capacity of Malaysia to achieve the national energy targets.

Objective

This research seeks to interrogate the multi-dimensional role of educationists in private higher education institutions (HEIs) in Klang Valley, Malaysia, in facilitating the transition towards affordable clean energy as a pathway to sustainable economic growth. While government roadmaps such as *MyRER 2021–2035* outline national commitments, there remains limited understanding of how these macro-level ambitions are internalised and operationalised by academic staff who shape curricula, research priorities, and institutional strategies. Thus, the objectives go beyond descriptive exploration and are instead designed to interrogate structural, cognitive, and policy-related tensions that determine the effectiveness of educationists as sustainability advocates.

RO 1: To critically examine educationists' perceptions of the integration of affordable clean energy into educational policies and curricula

RO 2: To evaluate educationists' awareness and understanding of technological innovations in renewable energy and how this shapes their pedagogical and institutional advocacy.

RO 3: To assess the adoption of sustainable energy management practices within private HEIs and their influence on educationists' ability to promote clean energy

RO 4: To analyse how government policies and support mechanisms enable or constrain educationists' advocacy of affordable clean energy

RO 5: To examine the role of public participation and awareness in amplifying or undermining educationists' clean energy advocacy and its broader link to sustainable economic growth.

Literature Review

The Capbillity Approach

This study is anchored in the Capability Approach, originally developed by Amartya Sen (1999) and later extended by Martha Nussbaum (2000). Unlike traditional development theories that measure progress through economic indicators such as Gross Domestic Product (GDP) or income levels, the Capability Approach shifts attention to the real freedoms and opportunities individuals possess to live the kind of life they value. In this perspective, development is defined not only by material advancement

but by the expansion of human capabilities—functionings and freedoms that empower individuals and communities to flourish.

In the context of clean energy adoption, the Capability Approach provides a powerful conceptual lens. Affordable clean energy is not merely a technological advancement or an environmental target; it is a capability enabler that expands the substantive freedoms available to people. Access to renewable energy enhances educational opportunities, supports economic participation, improves health and wellbeing, and safeguards environmental sustainability. Thus, clean energy adoption directly influences both individual welfare and broader societal progress.

Applied to educationists in private HEIs in Klang Valley, this framework underscores their role as agents of capability expansion. By embedding affordable clean energy knowledge into curricula, pedagogy, and institutional culture, educationists enable students to acquire the knowledge, skills, and values required to participate meaningfully in a low-carbon economy. Moreover, educationists contribute to shaping future leaders, engineers, entrepreneurs, and policymakers who are capable of advancing Malaysia's sustainability goals. Their agency therefore extends beyond teaching to include advocacy, leadership, and institutional transformation.

The Capability Approach also illuminates the structural inequities that hinder clean energy adoption. While Malaysia has advanced national energy transition roadmaps, private HEIs particularly those outside public funding streams face systemic barriers such as limited financial resources, weaker governance mechanisms, and insufficient professional development support for academic staff. These structural constraints diminish the capabilities of educationists to act effectively, confining them to symbolic gestures rather than transformative integration of clean energy in higher education. From a Capability perspective, this represents a form of capability deprivation, where educators are willing but unable to exercise their agency due to institutional or societal limitations.

Furthermore, the framework highlights the centrality of agency. Sen (1999) emphasises that individuals are not passive recipients of development but active agents of change. For this research, educationists are conceptualised as such agents, whose capacity to promote affordable clean energy depends on both their personal awareness and institutional environments. Their agency is critical for translating national policies (such as the NETR and MyRER) into practice, designing innovative teaching approaches, engaging in campus sustainability initiatives, and advocating for systemic reforms within their institutions. In this way, the Capability Approach aligns closely with the study's objectives of exploring how educationists perceive their roles, navigate institutional constraints, and contribute to sustainable economic growth.

A final dimension of the Capability Approach relevant to this research is its emphasis on collective wellbeing and intergenerational justice. Access to clean energy is not only a present-day capability but a determinant of the freedoms available to future generations. By promoting affordable clean energy, educationists expand not only the capabilities of their current students but also those of communities and industries that will benefit from a workforce equipped with sustainability-oriented knowledge and skills. In this sense, the adoption of clean energy in HEIs contributes directly to both sustainable economic growth (SDG 8) and affordable and clean energy (SDG 7)**,** reinforcing Malaysia's broader commitment to the United Nations Sustainable Development Goals.

Clean Energy in the Global Perspective and Affordablely.

In the past two decades, global policies on clean energy have evolved rapidly, with countries increasingly adopting systems that promote or regulate the use of renewable energy. International frameworks like the Paris Agreement and organizations such as IRENA have played significant roles in guiding nations toward renewable energy goals. Key trends in policy-making include the integration of multi-criteria decision-making tools, which consider not only economic and environmental factors but also societal acceptance and technological feasibility. Furthermore, the participatory approach in renewable energy policy-making, exemplified by models like Malaysia's PPRED model, emphasizes public involvement and stakeholder engagement in the planning process. This trend is seen globally, including in the EU's Renewable Energy Directive and the U.S., where federal policies require public consultations, demonstrating that legitimate, community-backed projects face fewer delays and financing challenges. Developed countries have increasingly adopted market-based policies, such as auctions and carbon trading, to lower costs and improve efficiency, although developing nations like Malaysia still face challenges regarding cost-effectiveness and institutional readiness to implement these advanced procedures.

In developing countries, the key challenges to affordable clean energy are the cost of capital, institutional capacity, and social acceptance. Despite the decreasing cost of renewable technologies like solar PV and wind, financial barriers such as high risk premiums, weak currencies, and poor credit conditions in low-income nations make these technologies less affordable. Institutional frameworks, including competitive bidding and auction systems, have helped lower renewable energy prices, but these methods often face delays and under-subscription due to inadequate grid infrastructure and procurement processes. Social acceptance also plays a vital role; communities often resist projects they perceive as unfair or non-transparent, leading to increased costs and project delays. Participatory models, like Malaysia's PPRED, demonstrate how engaging local communities and ensuring equitable benefit-sharing can reduce these barriers. Ultimately, while falling hardware costs are beneficial, achieving affordable clean energy in developing countries depends on effective governance, financing mechanisms, and societal involvement, underlining the importance of both technological and institutional progress in advancing clean energy adoption.

Clean Energy in Malaysia Outlook

Malaysia's clean energy transition is governed by several policies, including the Renewable Energy Act (2011) and the Feed-in Tariff (FiT) system, which initially promoted renewable energy sources like solar PV, biomass, and small hydro. However, the FiT faced issues such as tariff degradation and limited investor confidence, prompting the government to introduce the Net Energy Metering (NEM) scheme, which encourages solar energy self-consumption. Malaysia's Renewable Energy Roadmap (MyRER 2021-2035) aims to increase renewable energy capacity to 31% by 2025 and 40% by 2035, with a focus on solar. Despite these efforts, challenges remain, including policy inconsistencies, bureaucratic delays, and grid integration issues. The integration of clean energy into higher education institutions (HEIs) has been slow, with universities making progress through research and demonstration projects but lacking comprehensive institutionalized clean energy efforts in governance and curricula

In the Klang Valley, which houses both public and private universities, there is a marked difference in clean energy adoption. Public universities like Universiti Malaya (UM) and Universiti Kebangsaan Malaysia (UKM) have invested heavily in renewable energy technologies and research, benefiting from government funding and international collaborations. Meanwhile, private universities such as Sunway University and Taylor's University have also committed to sustainability but face challenges due to limited resources and reliance on external partnerships. Although educationists in these institutions are aware of the importance of clean energy, less than half actively integrate these topics into curricula due to insufficient professional development and financial incentives. Bridging this gap requires more robust support for educationists, particularly in private universities, to align academic practices with national clean energy goals

Policy and Curriculum Integration

There is evidence that integrating sustainability and clean energy into education policy and curriculum contributes materially to economic development. Vargas et al. (2019) in *"Implications of vertical policy integration for sustainable development implementation in higher education"* shows how multi-level policy alignment (national → institutional) enables universities to contribute more effectively to sustainable development outcomes. Likewise, *"Higher Education and Its Role for National Development: A mining of scientific texts"* (Trinh et al., 2023; Mohammad et al., 2025g) found that investments in higher education policy and curriculum correlate positively with productivity and economic growth in several countries. Thus:

H1: Policy and Curriculum Integration has a significant influence on economic growth.

Technological Innovation Awareness

Technological innovation, including awareness and adoption, is consistently linked with economic growth. Bajja et al. (2025) in *"Technological Innovation and Cleaner Energy …"* show that technological innovation (coupled with urbanization) positively contributes to economic growth while also fostering employment opportunities. Another study, *"The impact of technological innovation and governance institution quality on Malaysia's sustainable growth"* (Bekhet & Latif, 2018; Mohammad et al., 2025h), finds that technological innovation combined with governance quality significantly boosts Malaysia's economic performance. Hence:

H2: Technological Innovation Awareness has a significant influence on economic growth.

Institutional Energy Management Practices

Research is more limited specifically on institutional energy management within HEIs and its direct effect on economic growth, but broader studies support analogous relationships. For example, Suki et al. (2022) in *"The role of technology innovation and renewable energy in affecting ecological footprint…"* show that renewable energy technology use (which implies energy-management practices) helps reduce environmental externalities, allowing sustainable economic activity. Additionally, studies of innovation & governance in Malaysia (Bekhet & Latif, 2018) provide evidence that institutions with stronger governance and capacity for innovation (part of which includes operational practices) tend to show better economic growth outcomes. Therefore:

H3: Institutional Energy Management Practices has a significant influence on economic growth.

Government Policy and Support

Empirical studies indicate the importance of public policy and governmental structures in enabling innovation, education, and technological diffusion—which in turn play a role in economic growth. For example, *"Impact of technological innovation and governance institution quality on Malaysia's sustainable growth"* (Bekhet & Latif, 2018) highlights that governance, policy, and institutional quality moderate the effect of technological innovation on growth. Also, *"Higher Education and Its Role for National Development"* (Trinh et al., 2023) finds that government investment in higher education and supportive educational policies are statistically associated with improved economic development. Thus:

H4: Government Policy and Support has a significant influence on economic growth.

Public Participation and Awareness

Public awareness and participation are less directly measured in many economic growth studies, but there is evidence that sustainability and renewable energy outcomes depend on stakeholder engagement. For example, *"Promoting sustainable development via stakeholder engagement in higher education"* (Leal Filho et al., 2025) examines how stakeholder (including public) participation in HEIs strengthens sustainability impacts. Also, the study *"The effect of technological innovations, urbanization and environmental quality"* (Khan et al., 2023) shows that societal factors (urbanization, technology adoption) together shape environmental and growth outcomes, implying that awareness and public engagement matter. Therefore:

H5: Public Participation and Awareness has a significant influence on economic growth.

Methodology

This chapter delineates the research methodology employed to explore the perceptions of academic staff **in** private higher education institutions (HEIs) in the Klang Valley, Malaysia, regarding their role in promoting affordable clean energy and its connection to sustainable economic growth. Anchored in the Capability Approach (Sen, 1999; Nussbaum, 2000), the methodology is designed to capture both individual agency and structural constraints in integrating clean energy into curricula, institutional practices, and policymaking. A quantitative, non-experimental, cross-sectional design is adopted. Such a design is appropriate when assessing relationships between constructs at one point in time without manipulation of independent variables (Creswell & Poth, 2018). In sustainability education research, cross-sectional surveys are commonly used to understand faculty or institutional readiness and perceptions (Syed-Abdullah, Kushnir & Abdrahim, 2023). Additionally, studies on sustainability practices in private HEIs emphasize the measurement of perceptions and practices through structured questionnaires (Leal Filho et al., 2020). Data will be collected via a structured questionnaire adapted from validated instruments in clean energy, sustainability, and higher education research. Responses will use a five-point Likert scale to measure factors such as policy & curriculum integration, technological innovation awareness, institutional energy management practices, government support, and public participation, and how these affect educationists' perceived role.

Data analysis will be conducted using SPSS (or similar), including but not limited to: reliability testing (Cronbach's alpha), exploratory factor analysis, correlation analysis, and multiple regression analysis. These methods align with methodologies used in previous studies measuring perceptions and institutional sustainability practices (Almasri, Abu-Hamdeh & Al-Tamimi, 2024). The purpose of this study is to examine how academic staff in private higher education institutions (HEIs) in Klang Valley, Malaysia perceive and enact their role in promoting affordable clean energy toward enhancing sustainable economic growth. The focus on academic staff (lecturers, administrators, policy

coordinators) allows an in-depth understanding of the internal institutional factors, pedagogical integration, and policy awareness required for clean energy adoption. This purpose is grounded in existing literature that calls for more empirical work on sustainability practices in private HEIs and academic perceptions, especially in Malaysian context, where studies show private institutions face distinct challenges in governance, resources, and institutional commitment compared to public HEIs (Zhao et al., 2023).

Results

Response Rate and Demographic Analysis

A total of 379 questionnaires were distributed through digital platforms. Of these, 379 responses were received, yielding a 100% response rate, which meets the minimum requirement for multiple regression and moderation analyses. Among the respondents (n = 379), 26.9% were female, 59.6% were male, and 13.5% did not specify their gender.The fields of Engineering (26.6%) and Business (23.5%) account for the largest shares, with significant numbers in Social Sciences (21.4%) and Environmental Science (17.9%). The remaining share is in Education (5.5%) and Other fields (5.0%) (Refer to Table 1 & 2 below).

Table 1. Response Rate

Description	Results
Total questionnaires distributed	379
Total respondent received	379
Percentages of response rate	100%

Table 2. Field of Study of Respondents

Field_of_Expertise		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Business	89	23.5	23.5	23.5
	Education	21	5.5	5.5	29.0
	Engineering	101	26.6	26.6	55.7
	Environmental Science	68	17.9	17.9	73.6
	Other	19	5.0	5.0	78.6
	Social Sciences	81	21.4	21.4	100.0
	Total	379	100.0	100.0	

Factor Analysis

Bartlett test (.000) and actual sample adequacy (KMO score=.765) are highly significant and confirm the actual sample adequacy and strong correlation among the dependent items. This confirms factor analysis appropriateness and helps to achieve the stability of the theoretical construct in the entire dataset. The value of KMO=.734 and p=.000 of Bartlett's Test indicate strong sampling adequacy and correlation structure among independent variables. The findings warrant the continued use of PCA and establishment of instrument reliability using real respondents.

Reliability Test

Table 3. Reliability Analysis

Cronbach's Alpha	N of Items
.902	3

The following Cronbach's Alpha is.902 depicts great internal consistency in the first construct, meaning that the 3 items are generally consistent in measuring the Institutional Policies and Curriculum Integration with a very low level of measurement error. The respondents had a consistent interpretation of the items, which ascertained high reliability and applicability in further structural analyses (Refer to Table 3).

Table 4. Reliability Analysis

Cronbach's Alpha	N of Items
.922	3

The Alpha of.922 refers to the high level of reliability of Technological Innovation Awareness, which means that all items are strongly related and are able to measure the level of awareness of clean energy-related technologies. In the higher education sector, the construct exhibits high scale stability and internal alignment among respondents (see Table 4).

Table 5. Reliability Analysis

Cronbach's Alpha	N of Items
.924	3

The Practices of the Institutional Energy Management Construct registered an Alpha of.924, which is excellent confirmation of reliability. The three items, when taken together, yield consistent results, making them a highly reliable scale for studying the behaviours of institutional operational sustainability and energy management (see Table 5).

Table 6. Reliability Analysis

Cronbach's Alpha	N of Items
.864	3

The Cronbach's alpha for Government Policy Support was 0.864, indicating good reliability. It is slightly below the three constructs but still exceeds the suggested value.70 level, which confirms that items are useful for measuring perceptions of policy-driven sustainability initiatives (see Table 6).

Table 7. Reliability Analysis

Cronbach's Alpha	N of Items
.913	3

Public Participation Awareness demonstrated a high degree of reliability, with an alpha of 0.913. Its three items demonstrate strong internal consistency, indicating that the respondents are in agreement on the issues of community involvement and sustainability engagement in the context of higher education (see Table 7).

Table 8. Reliability Analysis

Cronbach's Alpha	N of Items
.940	5

Perceptions of Clean Energy and Sustainable Economic Growth was the most successful, with the highest alpha of 0.940, indicating high internal reliability. These findings affirm that it is a very strong main outcome measure for statistical analysis and hypothesis testing (see Table 8).

Multiple Regression Analysis

Table 9. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.986[a]	.972	.972	.86498
a. Predictors: (Constant), Public_Participation_Awareness, Institutional_Energy_Management_Practices, Institutional_Policies_and_Curriculum_Integration, Technological_Innovation_Awareness, Government_Policy_Support				

According to the Model Summary table, the correlation coefficient (R = .986) is very high, indicating a strong interdependence between the combined independent variables and the dependent variable, Perceptions of Clean Energy and Sustainable Economic Growth. The value of R-squared is equal to 0.972, which implies that the five predictors, Institutional Policies and Curriculum Integration, Technological Innovation Awareness, Institutional Energy Management Practices, Government Policy Support, and Public Participation Awareness, explain 97.2% of the variance in the dependent variable. This demonstrates the model's strong explanatory capacity. Also, the Adjusted R-squared (.972) proves the stability and the overall stability of the model. The low value of standard error (.86498) also implies the correct and sound prediction result (see Table 9).

Multicollinearity Check

Table 10. Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.056	.194		.289	.773
	Institutional_Policies_and_Curriculum_Integration	.830	.070	.490	11.829	.000
	Technological_Innovation_Awareness	.845	.072	.540	11.813	.000
	Institutional_Energy_Management_Practices	-.059	.075	-.039	-.793	.428
	Government_Policy_Support	.402	.101	.236	3.967	.000
	Public_Participation_Awareness	-.355	.072	-.217	-4.965	.000
a. Dependent Variable: Perceptions_of_Clean_Energy_Sustainable_Economic_Growth						

The coefficients table also provides information on the contribution of each independent variable to the prediction of Perceptions of Clean Energy and Sustainable Economic Growth. The most significant positive standardised effect is for Technological Innovation Awareness (b = .540, p = .000), indicating that innovation in clean-energy technologies can significantly contribute to stakeholders' perceptions of sustainability in higher education. The Institutional Policies and Curriculum Integration also exhibits a considerable positive effect (b = .490, p = .000), indicating that effective sustainability policies formulated in academic programmes influence knowledge of clean energy. Government Policy Support also makes a positive contribution (b = .236, p = .000), indicating that institutional confidence in national energy policies is a significant contributor to the development of sustainability attitudes. On the other hand, Public Participation Awareness shows a strong negative impact (b = -.217, p = .000), which may reflect perceptions that existing public engagement activities are inadequate or ineffective at promoting the development of clean energy. The effect of Institutional Energy Management Practices is not statistically significant (b = -.039, p = .428), indicating that internal energy management practices do not strongly influence overall perceptions. Overall, these results indicate that three predictors (Policies and Curriculum, Technological Awareness, and Government Support) positively and significantly contribute to the development of sustainability perception. Furthermore, public participation has the opposite effect, and energy management efforts need to be strengthened to have a greater impact on sustainability objectives (see Table 10).

Discussion of the Findings

Table 11. Hypothesis Result

Hypothesis	**Beta / Interaction Coefficient**	**Significance Value (p < 0.05)**	**Results**
H1: Policy and Curriculum Integration has a significant influence on economic growth	β = -.490	p = .000	**Accepted**
H2: Technological Innovation Awareness has a significant influence on economic growth	β = 0.540	p = .000	**Accepted**

H3: Institutional Energy Management Practices have a significant influence on economic growth	β = -.039	p = .428	**Rejected**
H4: Government Policy and Support have a significant influence on economic growth	β = 0.236	p = .000	**Accepted**
H5: Public Participation and Awareness have a significant influence on economic growth	β = -.217	p = .000	**Accepted**

The study showed that the data met all statistical requirements and demonstrated good construct reliability and validity. The descriptive results indicated that respondents represent a variety of backgrounds and have high levels of sustainability participation. A regression analysis showed that policies, technology awareness, and government support are strong predictors of perceptions of the clean energy economy, whereas energy management and public participation are weak predictors. Overall, the research results provide strong evidence of the model's relevance to sustainable development in higher education.

RO 1: To critically examine educationists' perceptions of the integration of affordable clean energy into educational policies and curricula

The findings of this chapter support H1, which suggests that Institutional Policies and Curriculum Integration are significant predictors of Perceptions of Clean Energy and Sustainable Economic Growth. The regression findings indicate that the standardised coefficient (β = .490, t = 11.829, p = .000) is significant and positive. This proves that the institutional level curriculum design and policy implementation centred on sustainability are essential in creating awareness and support for the clean energy initiatives. Academic programmes can incorporate the concept of sustainability effectively; in that case, educators will be more inclined to acknowledge the importance of the clean energy transition and its role in advancing national economies. These policies may be seen as an enabler mechanism that leads to the dissemination of knowledge, research orientation and competencies essential to the adoption of a green economy. Thus, universities that have strong sustainability governance are in a better position to come up with graduates and research outputs that are in line with the economic energy needs in the future. The findings confirm the fact that augmenting the sustainability of institutional curriculum is closely related to increasing economic perceptions of clean energy (see Table 11).

RO 2: To evaluate educationists' awareness and understanding of technological innovations in renewable energy and how this shapes their pedagogical and institutional advocacy.

The empirical results definitely support this hypothesis, H2. The Technological Innovation Awareness had the greatest positive impact of all predictors with (β =.540, t = 11.813, p =.000), which is highly statistically significant. This finding suggests that perception of sustainable economic growth would be greatly boosted by awareness and exposure to clean energy-related technologies and use. Awareness of modern green technologies by the educationists will help them realise their economic prospects, such as the reduction of costs and carbon, and new industrial opportunities. Therefore, the increased technological literacy is associated with an increase in confidence in the shift towards economic development based on the use of renewable energy. The results emphasise how innovation adoption can be used in institutions of higher learning to enhance the development of green skills and the commercialisation of research. As a result, technological innovation is a decisive precipitant of the clean energy revolution in the Malaysian economy (see Table 11).

RO 3: To assess the adoption of sustainable energy management practices within private HEIs and their influence on educationists' ability to promote clean energy

The findings indicate that the H3 is rejected, because Institutional Energy Management Practices do not have a significant impact on the economic growth perception. The value of the coefficient (β = -.039, t = -.793, p =.428) shows a weak contribution that is not statistically significant. This implies that the daily operational energy management activities that take place in institutions like minimisation of electricity use or efficiency on the facilities are not observable or significant enough to change the general view of educationists on the cost-economic benefits of clean energy transition. Energy management can take place at the internal level, but is not seen as a direct influence on the results of economic sustainability at the national level. The lack of significance also means that there can be no strategic alignment of the sustainability initiatives of the institution or proper communication with the

stakeholders. Thus, operational sustainability is a critical factor, but the current activities are not enough to form the perception concerning the economic advantages of clean energy (see Table 11).

RO 4: To analyse how government policies and support mechanisms enable or constrain educationists' advocacy of affordable clean energy

The results support H4, which states that Government Policy and Support make a significant contribution to the positive perception of economic growth powered by clean energy. Regression results indicate that (β = .236, t = 3.967, p =.000), making the result highly statistically significant. The role of government through national renewable targets, incentives, energy efficiency regulations, and policy advocacy is vital in developing a sense of confidence among the stakeholders on the clean energy development progress. Educationists tend to be more positive about sustainability outcomes when they are confident that the government is committed to pursuing energy transition and economic diversification over the long term. Investment in renewable sectors in the country helps the enhancement of jobs, localisation of the technology, and enhancement of the ecosystems of green knowledge. This creates confidence that the clean energy sector is capable of providing economic resilience and competitiveness. Therefore, streamlined and regular policy agreements are effective in enhancing stakeholder compliance with green economic goals (see Table 11).

RO 5: To examine the role of public participation and awareness in amplifying or undermining educationists' clean energy advocacy and its broader link to sustainable economic growth.

The results show that H5 is not upheld, since Public Participation and Awareness exhibited significant yet negative impact on the thinking of the role of clean energy in economic development (β= -.217, t = -4.965, p =.000). Even though the involvement of the people is usually anticipated to foster the growth of sustainability, this adverse outcome implies discontent or cynicism about the existing engagement programs. The citizens might not be sufficiently empowered, informed or involved in the current sustainability campaigns, resulting in poor contribution to the energy transition process. It is also an indication of a communication gap, as when people do not know the real economic advantages of clean energy, they will not support or engage in initiatives aimed at the same. Hence, more robust community-level interventions, sensitisation and partnership efforts are required in order to make community engagement a force to reckon with. Through more openness, education and access, societal involvement can be converted into an engine instead of a hindrance to the economic development of renewable energies (see Table 11).

Contribution

Contribution to Literature

The study adds value to the literature on sustainability and clean energy education in the Malaysian context, particularly on the topic of the private HEIs in Klang Valley which has been a less-researched area in the past. It helps to enlighten theoretical knowledge on the influence of structural, policy, and cognitive aspects on the capacity of educationists to facilitate affordability and sustainability in the energy sector. The results confirm the role of educationists as important in between policy and the awareness of society, and, in this context, the theories of capacity development in the context of sustainable transitions are validated. In addition to this, the research adds an empirical base of connecting education, energy transition, and sustainable economic growth as well as a conceptual foundation to future research on clean energy advocacy in higher education institutions.

Contribution to Industry

This research offers practical insights into how sustainable work practices can enhance employee WLB for practitioners and organizations operating in the Malaysian financial services sector. They can more effectively prioritize HR interventions and policies by identifying which practices are most impactful. For instance, the findings on moderation effects reveal that organizational support plays a nuanced role and does not always amplify the positive outcomes of sustainable practices, underscoring the need for strategic alignment rather than blanket implementation.

Moreover, the study reinforces the importance of embedding sustainability not just into external reporting or CSR initiatives but into core HR functions. It provides evidence-based support for integrating SDG 3 and SDG 8 into workplace policy frameworks, encouraging employers to consider employee well-being and equitable work practices as part of their long-term sustainability strategy.

Finally, this study helps industry stakeholders including policymakers, HR professionals, and senior management to understand that sustainable work arrangements are not just employee perks but

strategic levers for enhancing employee satisfaction, reducing burnout, and improving organizational resilience.

Limitations and Future Research

The study was only conducted to private institutions of higher learning in Klang Valley and therefore the findings would not be generalised to the university in public or other parts of Malaysia. The research was based on self-reported perceptions that are likely to contain subjectivity in understanding and social desirability bias. The lack of time did not allow investigating all the potential determinants, such as cultural or leadership-based drivers of clean energy adoption. At the same time, there was only an assessment of perceptions as opposed to longitudinal observations of actual behavioural change or an institutional intervention. Nevertheless, the research article has a lot to offer with respect to the current challenges and opportunities of clean energy advocacy among the educationists in the private HEIs.

Conclusion

This study concludes that educationists in the private higher education institutions positively perceive affordable clean energy but are hindered by challenges that make positive implementation a challenge. Their advocacy role can get improved by strengthening policy integration, funding support, technological exposure, and commitment of the institutions. Through educationists empowerment, universities will be able to become stakeholders in the sustainable economic change in Malaysia. The research achieves its aims and objectives by revealing some of the most important gaps and giving viable solutions, which will be in tandem with the national sustainability objectives.

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