

INDUSTRIAL SECTORS' PERCEPTION TOWARDS RENEWABLE ENERGY SOURCES IN JOHOR, MALAYSIA

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Submitted final draft: 22 October 2023

Accepted: 19 November 2023

<http://doi.org/10.46754/jbsd.2023.09.006>

Abstract: Johor is a state in Malaysia with an industry sector that is known to use the highest amount of fuel to generate electricity. Because renewable energy is expensive, the industry prefers nonrenewable fuel sources. This will hinder the government's fuel reduction goal if not addressed immediately. This sector's participation is crucial to meeting the goal. This study examines industrial perceptions of renewable energy. There were three factors, together with eight items, used in this study to investigate the level of perception of the industrial sector towards renewable energy sources, namely, cost, the impact on the environment, and the role of the government. This study employed face-to-face interviews with 200 industrial units. The information came from the industry's energy resources managing director. A descriptive analysis was conducted to observe their perception levels through STATA Version 13. The higher percentage of respondents who support renewable energy sources confirms this. The study found that most industrial units strongly agree that the cost of maintaining renewable energy sources is too expensive. The industrial unit strongly believes that a clean environment is essential for future generations and that the government should subsidize renewable energy sources. The outcome of this study can help policymakers articulate relevant policies for the industrial sector.

Keywords: Renewable energy, Johor, industrial units, perception level.

Abbreviations: STATA13, SDG.

Introduction

Solar, hydropower, biogas, and biomass are just a few of the renewable energy sources that are abundant in Malaysia. However, Malaysia's consumption of renewable energy is still far lower than the global average and the average for the 10 ASEAN nations' consumption of non-renewable energy (World Bank Data, 2020). This suggests that Malaysians are still unaware of the advantages and benefits of renewable energy. Therefore, if this scenario is not addressed, it will undermine the government's goal to lessen its reliance on non-renewable energy and achieve a decrease of up to 45% in terms of GDP's emissions intensity by 2030.

In Malaysia, according to Associate Professor Dr. Aimi Zulhazmi Abdul Rashid, an economist from the University of Kuala Lumpur (UniKL) Business School, one of the factors contributing to the low uptake of renewable energy is its high cost (Bisnes Metro, 3rd July 2022). Despite Malaysia's abundance of renewable energy resources, fewer investors are choosing to engage in this form of energy due to the high costs of its development. The government's decision to launch some fresh programmes to promote Malaysians' usage of renewable energy is a step in the right direction toward enhancing environmental cleanliness

and lowering future reliance on non-renewable energy sources. Utilizing renewable energy is excellent for the environment. This has been demonstrated by a prior study by Inglesi-Lotz (2016), which discovered that using renewable energy had a smaller environmental impact than using non-renewable energy.

Based on the above-mentioned issues, this paper aims to identify the perception levels of the industrial sector towards renewable energy sources in Johor, Malaysia. Knowing the perception levels of the industrial sector is crucial in order for the government to know which items to focus on when making plans to meet its 2030 renewable energy target. Moreover, this research will be a significant contribution to the literature on renewable energy in Malaysia. This study would add to the existing literature on renewable energy as well as contribute to the development of predictive model building and possible theory development. The organization of the study is as follows; the introduction section presents the renewable energy issues in Malaysia; the literature review section focuses on the theoretical and empirical studies. The data and methodology employed in this study. Next, the empirical results section discusses the findings of the study, and the conclusion section concludes the whole study and the limitations of the study.

Literature Review

The cost of renewable energy is one of the most important factors that influence consumers to use renewable energy. According to Zakaria *et al.* (2019), the high cost of renewable energy technologies could explain why the public is unconcerned and ignorant about the government initiative to empower renewable energy in Malaysia. Nevertheless, people who care more about the environment will probably pay more for renewable energy (United States Energy Information Administration, 2022).

In the domain of types of energy sources, the public knows that energy sources and environmental concerns are intimately

intertwined since it is practically impossible to use energy without having a substantial environmental impact. Air pollution, climate change, and solid waste disposal are some of the environmental issues linked to the consumption of energy. In 2021, the United States' largest source of CO₂ emissions was its electric power industry which burned fossil fuels or materials made from fossil fuels (United States Energy Information Administration, 2022). CO₂ is a greenhouse gas which has caused many negative effects on the environment. Although renewable energy sources have a positive effect on the environment and has an endless supply overall, their availability at any particular time is constrained.

In terms of government roles, a study conducted by Yang *et al.* (2019) found that government subsidies are one of the important sources of funding for renewable energy in China. In Malaysia, the government provides financial institutions with a 60% government guarantee of the cost of green components as well as a 2% annual interest/profit rate subsidy for the first seven years (Sustainable Energy Development Authority (SEDA), Malaysia, 2021). Although the government has provided subsidies to the public, the number of renewable energy users are still low in Malaysia. Presently, Malaysia produces 22.4% of its power from renewable energy (Suskind *et al.*, 2020) and Malaysia has set a target to produce 30% by 2030 (KeTTHA, 2017). To achieve this target, it is estimated that Malaysia needs approximately RM33 billion [US\$8 billion (about \$25 per person in the US)] worth of investments in its renewable energy sector (Global Data Energy, 2019). Thus, it is still a long journey to achieve the target and commitments should be taken up by many parties.

Methodology and Data

The perception level of the industrial sector towards renewable energy in Johor, Malaysia will be examined by using descriptive analysis. There are three perception factors of renewable energy with eight items as stated in Table 1:

Table 1: Perception’s factors of renewable energy

Factors	Items
i. Cost	Firms pay more for renewable energy; firms are not willing to pay more for renewable energy; the cost of maintainece of renewable energy sources is too expensive.
ii. Impact on the environment	Types of energy used affect the environment; renewable energy can reduce global warming; which is important for future generations.
iii. Government’s role	Provide subsidies to renewable energy sources; provide more renewable energy policies.

Likert scale is used to measure the perception levels of the industrial sector towards eight renewable energy items with scores ranging from 1 to 5. The level of agreement based on the score is stated in Table 2:

Table 2: Level of agreement

Score	Level of Agreement
1	Strongly disagree
2	Disagree
3	Undecided
4	Agree
5	Strongly agree

The population of interest consists of the industrial sector in Johor, Malaysia. The industrial sector in Johor was the setting for this study. Based on information from the economic census in 2016, the Department of Statistics Malaysia (2021) reports that there were 49,101 registered industrial units in Malaysia, with 8,046 of those units being active in Johor. In this study, we followed the guidelines offered by Sekaran (2003) which suggested that sample sizes greater than 30 and fewer than 500 would be suitable for the majority of the research. Najib (1998) also asserts that 30 respondents is sufficient to reflect the population. According to this rule, a sample of 200 respondents surveyed in Johor was randomly selected. Face-to-face interviews were used in this study. The sample group included 200 registered industrial units in Johor, Malaysia, whose electricity bills were over RM77.00 per month in various sub-units. The managing directors or general managers in charge of the factories’ energy resources provided the information. Between April 2022 to September 2022, a period of around five months, the survey was conducted.

A pilot test was conducted earlier with 30 randomly chosen participants. The objective of conducting a pilot test was to fine-tune the questionnaire before we proceeded with the final survey. The majority of respondents were able to comprehend and react to the questions. Thus, the questionnaire was only slightly modified for clarity. The purpose of the pilot test was to ensure that the respondents could understand the questions and that they were straightforward. In general, it was noted that the chosen respondents needed help completing the surveys.

The Statistics data analysis was performed using the Econometric software, STATA Version 13.0. A descriptive analysis is demonstrated to examine all the data in taking into consideration nature and the goals of this study. A mathematical calculation called descriptive highlights was a key aspect of the data sample (Heiman, 1996). In this study, descriptive analyses are frequently used to determine the perception levels of the industrial sector to use renewable energy in their factory. In addition, descriptive analyses can help give basic details about the variables in a

dataset. Finally, the primary goal of this study will be addressed as a result of these analyses.

Empirical Results

The empirical result will be presented in this part which is the first part presenting the background of industrial units, meanwhile, the second part will present the percentage share (%) of perception level towards renewable energy sources.

Background of Industrial Sectors

The industrial sector in Johor was chosen in this study as it consumes the most energy in Malaysia and it is the state with the highest industrial growth in ten economic clusters namely; Tangkak, Segamat, Kluang, Mersing, Kota Tinggi, Kulai, Johor Bahru, Pontian, Batu Pahat, and Muar (Johor State Economic Planning Division, 2021).

The traits of the industrial sectors are shown in Table 3. The survey included 200 industrial units. About 11.0% of industrial units use electricity from renewable resources, while another 89.0% of industrial units do not

use renewable energy resources for electricity. This implies that the awareness about the advantages of renewable energy resources is still less among the industrial units. Out of 11.0% of industrial units that use renewable energy resources to generate electricity, there are 2.5% involved with the Feed-in-Tariff program, 2.0% involved with the large-scale solar and self-consumption program, and 4.50% involved with the RE incentive program. All the interviewees of industrial units incurred electricity bills exceeding RM77.00 per month (100.00%). In the case of types of sub-units, out of 200 industrial units, 20.0% produced petroleum, chemical substance, rubber, and plastic, 19.5% produced transportation items, 15.0% produced non-metal, metal, and fabrics, 14.0% produced foods, beverages, cigarette, 12.5% produced wood, papers, and printing, 12.0% produced textile, clothes, shoes, and 7.0% produced electrical and electronic items. All the industrial units that answered this survey question are registered companies. Unregistered industrial units will be excluded from this survey as we only included registered companies as respondents in the study.

Table 3: Background of industrial units (n = 200)

Characteristics	Frequency	Percentages (%)
Electricity generation from renewable energy sources		
Yes	22	11.0
No	178	89.0
Types of programs used to generate electricity from renewable energy sources		
Not generate electricity from renewable energy sources	178	89.0
Feed-in-tariff	5	2.5
Large scale solar	4	2.0
Self-consumption	4	2.0
RE incentive	9	4.50
Electricity bill above RM77.00		
Yes	200	100
No	0	0

Characteristics	Frequency	Percentages (%)
Types of sub-units		
Electrical and electronic	14	7.0
Petroleum, chemical substances, rubber, and plastic	40	20.0
Woods, papers, and printing	25	12.5
Foods, beverages, and cigarette	28	14.0
Textile, clothes, and shoes	24	12.0
Non-metal, metal, and fabrics	30	15.0
Transportation and others	39	19.5
Registered company		
Yes	200	100
No	0	0

Percentages Share (%) of Perception Level Towards Renewable Energy Sources

Table 4: Cost factor

Statements	1	2	3	4	5	Mean Value
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	
Industrial sectors have to pay more to use renewable energy sources.	14.50	11.50	6.00	30.00	38.00	3.66
Most consumers are not willing to pay more to protect the environment.	0.00	1.50	1.50	36.50	60.50	4.56
The cost of maintaining renewable energy sources is too expensive causing this resource to be underutilized.	0.50	1.00	2.50	20.00	76.00	4.70

The percentage share (%) of industrial sectors' perceptions on renewable energy sources with regards to the cost factor is shown in Table 4. 38.00% of respondents strongly agreed that industrial units should be forced to pay extra to generate electricity using renewable sources. Only 6.00% of respondents were undecided about this, compared to 30.00% who agreed, 11.50% who disagreed, and 14.50% who strongly disagreed.

In terms of environmental protection, 60.50% of the respondents strongly agreed that using renewable energy sources would help preserve the environment even if they were not willing to pay more for it. Meanwhile, 36.50% of the respondents agreed that they would not be willing to pay additional money to protect

the environment, and 1.50% of the respondents disagreed and were undecided about this.

Most respondents (76.00%) strongly agreed that the cost of maintaining renewable energy sources is too expensive, causing these resources to be underutilized. Only 0.50% of them strongly disagreed, 1.00% of the industrial units disagree, and 2.50% were undecided towards the higher maintenance cost of renewable energy. While 20.00% of them strongly agreed with the statement.

Based on Table 4, the highest mean value is in the third statement (4.70), which is the cost of maintaining renewable energy sources is too expensive, causing these resources to be underutilized, followed by the second statement (4.56), which is that most consumers are not

willing to pay more to protect the environment. The lowest mean value was observed in the first statement (3.66), which said that the industrial units must pay more to use renewable energy

sources for electricity generation. This result implies that the maintenance cost of renewable energy sources are the most crucial factor in encouraging the use of renewable energy sources among industrial units.

Table 5: Environment impacts' factor

Statements	1	2	3	4	5	Mean Value
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	
The types of energy used will have an impact on the environment.	0.50	0.00	4.00	47.50	48.00	4.43
The use of renewable energy will reduce global warming compared to the use of non-renewable energy.	0.50	1.50	5.00	31.50	61.50	4.52
The use of renewable energy sources is important for future generations to enjoy a clean environment.	0.50	0.50	3.00	21.00	75.50	4.69

Table 5 shows the findings of the industrial units' perception towards renewable energy regarding the environmental impact. Most of the industrial units highlighted that they strongly agreed (48.00%) and agreed (47.50%) that the types of energy used will have an impact on the environment. Only 4.00% of them were undecided and 0.50% of them strongly disagreed that the type of energy used will have an impact on the environment.

In terms of global warming reduction, majority of the industrial units strongly agreed (61.50%) that the use of renewable energy will reduce global warming compared to the use of non-renewable energy. 31.50% of them claimed that they agreed that the use of renewable energy will reduce global warming compared to the use of non-renewable energy. Only 1.50% of industrial units disagree and 0.50% of them strongly disagree that global warming can be reduced by the use of renewable energy, whilst 5.00% of them were undecided.

Most of the industrial units strongly agreed (75.50%) and 21.00% of them agreed that the use of renewable energy sources is important for future generations to enjoy a clean environment. There were 0.50% of them strongly disagreed and disagreed that this factor could affect future generations. Meanwhile, 3.00% of them showed their perception as undecided.

Based on Table 5, the highest mean value is in the third statement (4.69), which is the use of renewable energy sources is important for future generations to enjoy a clean environment, followed by the second statement (4.52), which is that the use of renewable energy will reduce global warming as compared to the use of non-renewable energy. Respondents put the lowest mean value on the first statement (4.43), which is the type of energy used will impact the environment. This result implies that respondents are aware that environmental care is important for future generations by placing the highest mean value on this statement and making it the most important factor to encourage the use of renewable energy sources among the industrial unit sectors.

Table 6: Government's role factor

Statements	1	2	3	4	5	Mean Value
	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	
The government should provide subsidies to renewable energy sources.	0.00	0.50	2.50	18.50	78.50	4.75
Need more policies from the government to encourage consumers to be aware of the use of renewable energy sources.	0.00	2.00	6.50	32.00	59.50	4.49

Table 6 shows the findings of the industrial 'units' perception towards renewable energy regarding the government's role. The majority of them strongly agreed (78.50%) that the government should provide subsidies for renewable energy sources. 18.50% of them agreed that subsidies should be provided by the government for renewable energy. Only 0.50% of them disagreed and 2.50% of them were undecided.

In terms of policies from the government, 59.50% of the industrial units strongly agreed and 32.00% agreed that the government should provide more policies to encourage them to be aware of the use of renewable energy sources. Only 2.00% of them disagreed with having more renewable energy policies from the government, whilst 6.50% of them indicated that they were undecided.

Based on Table 6, the highest mean value is in the first statement (4.75), which is the government should provide subsidies to renewable energy sources. Respondents put the lowest mean value on the second statement (4.49), which is that respondents need more policies from the government to encourage consumers to use renewable energy sources. This result implies that subsidies from the government for renewable energy are the most an important factor in encouraging the use of renewable energy sources among industrial units.

Conclusion

The majority of the industrial unit's perception towards renewable energy in Johor, Malaysia is at the strongly agreed level. This is attested by the higher frequency of respondents that give a strongly agreed level towards perception's factors of renewable energy. Based on the result, most of the industrial units are willing to pay more to use renewable energy sources for electricity generation and they are aware that the type of energy used will have an impact on the environment and global warming. Additionally, they strongly agreed that the government should provide subsidies for renewable energy sources.

The findings of this study will help policymakers develop an appropriate strategy to encourage the consumption of renewable energy among industrial units. To obtain long-term benefits, policy changes must be carefully considered. The government has established a goal of using 31% renewable energy by 2035 (Malaysia Renewable Energy Roadmap, 2021). In order to assist the government's effort to promote renewable energy in Malaysia, public participation is vital. The public's engagement and support will be necessary for a good system of using renewable energy, and this is still a crucial component of an effective energy strategy.

Renewable energy solutions are becoming more dependable and efficient every day. Applying these new energy solutions as fast as

possible is crucial to combat climate change. Goal 7: Affordable and Clean Energy highlights to ensure access to energy for all by 2030, everyone should have access to affordable, dependable, sustainable, and modern energy, which is one of the Sustainable Development Goals (SDG) aim. Hence, to ensure universal access to energy, we must expedite electrification, expand investments in renewable energy, and improve electrical networks.

A limitation of this study is that only three factors were identified and examined. There are likely additional factors that significantly impact how industrials sector in Johor perceive renewable energy. For instance, Liligeto *et al.* (2014) claims that in addition to the variables found in this study, product information, qualities, and socio-cultural factors also have an impact on the public's perceptions. This research's weakness is that these three criteria were not considered.

This research was not supported by any financial resources. The scope of research, which aims to identify perception levels of industrial units towards renewable energy in Johor, Malaysia is vast. Better findings might be obtained if given resources to conduct a more thorough study. For instance, with sufficient funding, this research may include opinions from leading Malaysian energy companies in the field of renewable energy. Financial constraints have thus hampered the inability of this research to address the shortcomings of earlier studies. However, many past studies have investigated subjects identical to those covered in this study.

Acknowledgements

The Sustainable Energy Development Authority (SEDA), Tenaga Nasional Berhad (TNB), and Universiti Malaysia Terengganu (UMT) in Malaysia are to be thanked for providing the opportunity and all the assistance needed to conduct this study.

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