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Renewable Energy Scenarios for Sustainable Electricity in Malaysia and the Application of Analytical Hierarchy Process (AHP) for Decision-making

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ABSTRACT

Renewable energy (RE) is an important addition to existing energy systems, indispensable to the sustainable development of human society now and in the future. Renewable energy is advantageous as it is clean, renewable and sustainable. Although the global power supply mainly relies on fossil fuels, as fuels are consumed and the formation cycle is extremely long, resources will gradually decrease and costs will increase accordingly. There are many types of renewable energy, and the selection of which RE should be chosen in a specific situation depends on many factors. The objective of this study is to develop a decision-making framework based on the Analytical Hierarchy Process (AHP) which covers four available renewable energy technologies in Malaysia. Through this process, the most critical issues in implementing the renewable energy systems can and have been identified which includes technology, ecological environment and market issues that must be overcome. The AHP results show that hydropower has great potential for electricity generation in Malaysia, while biomass and wind are ranked second and third respectively, and solar is ranked fourth. Nevertheless, this research had only considered four criteria with limitations in terms of the sub-criteria chosen. The accuracy of this framework may be improved if additional criteria are included and analyzed which can closely simulate the actual scenario of renewable energy development in Malaysia. Hence, through continuous optimization of the energy structure, energy security can be ensured while regional development strategies can be promoted for a balanced development of sustainable energy systems in the region.

Keywords: Decision-making framework; Analytical Hierarchy Process (AHP); renewable energy

INTRODUCTION

In the past few decades, the revelation of the adverse effects of fossil fuels has spurred efforts into the development of renewable energy (RE). This change in perspective can be seen from various actions taken by countries all over the world including policy changes, investments into renewable energy research and development, capacity building and implementation of renewable energy facilities. Nazir et al. (2017) believed that renewable energy consumption has a positive impact on the environment because it plays a key role in reducing greenhouse gases and other air emissions. Renewable energy consumption is critical for ASEAN countries, especially Malaysia, as electricity consumption reached an all-time high of 14,694 GWh in May 2019. From this data, it was estimated that electricity generation from fossil fuels alone will not be enough to sustain the country's electricity consumption in the long term (Malaysia Electricity Production 2021).

The rapid improvement of living standards also contributes towards increasing annual electricity consumption and puts pressure on the power supply sector. Currently, fossil fuels are the main energy source for power supply, and its resources are constantly decreasing as the demand for electricity increases. Therefore, with increasing rates of fossil fuel consumption, costs tend to increase due to resource scarcity (Kåberger 2018). In addition, power plant operation also becomes more expensive due to increasing societal demands for improved safety and reduced pollution (Kåberger 2018). While ensuring energy security and being mindful of the environment in existing fossil fuel power plant processes, the energy industry had also turned to the development of renewable energy. Moreover, the government's active introduction of various policies related to renewable energy and several incentives to stimulate investment in renewable energy are key to sufficient growth of renewable energy systems while improving the current economic development model that relies on fossil fuels (Yatim et al. 2016). Abdullah et al. (2019) stated that the Government of Malaysia has set an encouraging target to achieve a high degree of penetration for renewable energy in the overall energy mix in Malaysia.

Despite the advantages of renewable energy, there are many challenges that restrict its application in existing energy systems. There may also be certain conditions that prioritize one type of renewable energy to be selected over another. Hence, this study was aimed to develop a decision-making framework of the available renewable energy options in Malaysia based on the Analytical Hierarchy Process (AHP). This paper also determined the most critical issues that must be overcome before implementing that particular renewable energy system.

METHODOLOGY

RESEARCH DESIGN

This study is a combination of an exploratory case study and a descriptive study involving a systematic evaluation of secondary data analysis based on the AHP technique. This is to explore and describe the application of renewable energy technologies in power generation and the relationship between energy and electricity supply. The key issues that may affect the development of renewable energy technologies in Malaysia were also analyzed.

SECONDARY DATA COLLECTION

The data used in this study are secondary data, which came from journals, government documents and policies, and different databases. These data were collected based on four options of renewable energy including solar, hydro, biomass and wind. Then, the data were collated and categorized under four different factors including technology, economy, environment and policy. The technology factor includes current process, major equipment, and innovation; economical factor included cost (both capital and operating), market demand and tax; environmental factor included land requirement, water demand and ecological environment; while policy included current regulations, relevant laws, and carbon rating.

AHP METHODOLOGY

The data collected are analyzed using the AHP methodology as shown in Figure 1 below. The data were classified according to the renewable energy sources (solar energy/ wind energy/ biomass energy/ hydropower) and structured temporally from 2010 to 2020.

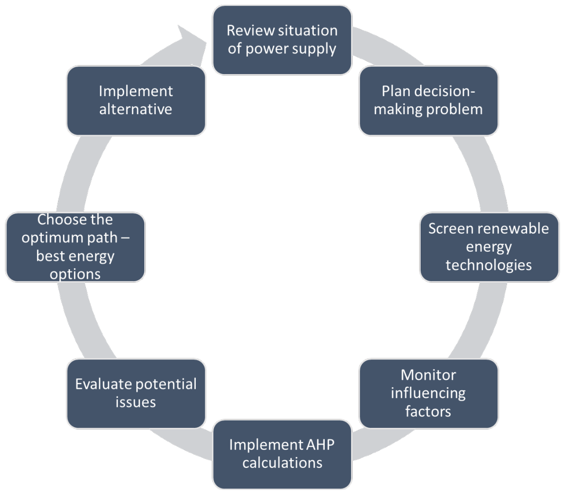

FIGURE 1. AHP decision-making process

The AHP module was then developed with the goal of screening renewable energy. The criteria levels were technical, economical, environmental, and administrative (policy) factors while the four RE choices, hydropower, solar, wind, and biomass were inserted into the decision level, followed by the 12 potential issues. Then, a comparison matrix was constructed and pairwise comparison was made for each criteria. The value of the comparison matrix was based on Saaty's Scale of Relative Importance in which throughout the process of mutual comparison in AHP, elements of the same level need to be relative to the corresponding superior element. In the consistency test, the consistency index is calculated: CI=(λ(A)-n)/(n-1). λ_{max} is the maximum eigenvalue of the matrix. Then for each value of CI, the corresponding average random consistency index (RI) was determined through: Consistency Ratio (CR)=CI/RI.

RI is called the average random consistency index. When the consistency ratio (CR) < 0.1, the judgment comparison matrix has satisfactory consistency, or the degree of inconsistency was acceptable. When a negative value is calculated, the pairwise comparison has to be adjusted until a consistent value was achieved.

After the judgment matrix has passed the one-time test, weights between the adjacent lower-level elements related to each element were calculated except for the solution level (to calculate the weight of the judgment matrix). Commonly used methods for the largest eigenvalue and eigenvectors include the square root method and the sum method.

The decision, or the goal of the AHP can then be chosen based on the weight of each element, which were sorted accordingly.

FRAMEWORK DEVELOPMENT

The results obtained by AHP were used to develop the framework based on different technical, economical, environmental, and policy scenarios in Malaysia. This framework is based on the calculations performed during the AHP analysis and includes multiple technical, environmental, economical, and regulatory scenarios, which were developed as a tool to assist decision-makers in making decisions about which renewable energy to be adopted within a specific context. It also identified the challenges of implementing specific technologies.

RESULTS AND DISCUSSION

For a country, energy is one of the key indicators showing economic and social development and the improvement of the quality of life. In the past 10 years, due to population growth and rapid urbanization, Malaysia's rapid increase in electricity demand has promoted the development of renewable energy. Among the different forms of renewable energy, hydro is one of the main resources in Malaysia. In the country, renewable energy consumption accounts for about 20% of the total energy consumption, of which about 72% comes from hydropower energy. The changes in renewable energy over the past ten years are shown in Table 1 below:

TABLE 1. Energy mix capacity in Malaysia (2011-2020) as reported by the International Renewable Energy Agency (IRENA)

Year	Hydro (MW)	Solar (MW)	Bioenergy (MW)	Biogas (MW)	Total (MW)
2011	3121	1	774	8	3904
2012	3449	25	768	12	4254
2013	4535	97	1045	14	5691
2014	4761	166	1431	18	6376
2015	5742	299	1580	36	7657
2016	6121	279	1558	80	8038
2017	6145	370	818	70	7403
2018	6165	536	839	84	7624
2019	6245	882	919	124	8170
2020	6275	1493	931	134	8833

From 2011 to 2020, the total capacity (MW) of renewable energy have increased by 55.2%. Hydropower energy also increased by 50.3% in 2020. Solar energy technology had gradually matured, becoming the second most widely used renewable energy in the country. This is assisted by the benefit of the geographical location of Malaysia that receives constant sunlight year-round. Another energy resource that is prominent in the country is from bioenergy based on biomass utilization which grows steadily annually.

POTENTIAL OF RENEWABLE ENERGY

Based on the data collected from Abdullah et al. (2019), the total potential of renewable energy in Malaysia can be summarized as shown in Table 2:

TABLE 2. Estimation of renewable electricity sources in Malaysia

RE electricity sources	Potential
Small hydro	500 MW
Solar PV	6,500 MW
Biomass	2400 MW
Large - hydro	29,000 MW
Wind offshore energy	42.68 MW

In this table, the largest potential is clearly hydro power where 29,500 MW each year can be produced, followed by solar PV (6500 MW/year), biomass (2400 MW/year) and offshore wind (42.68 MW/year). Therefore, hydropower has the highest potential of renewable energy electricity while the offshore wind has the lowest potential.

Despite its potential, hydropower is highly dependent on the location. This is one of the reasons why solar energy projects are one of the most widespread forms of renewable energy in Malaysia due to the modular nature which enables easy installation, customized capacity (low or high based on individual or organization needs), the decreasing production cost of photovoltaic (PV) equipment and easier financing for green projects in Malaysia.

According to the annual report published by SEDA (2020), of all approved renewable energy projects in 2019, solar energy was the most popular RE resource project in Malaysia, and many investments has been made on solar projects, as well as various fiscal instruments offered through Malaysian Investment Development Authority (MIDA). For example, Gading Kencana has developed, constructed, and operated two solar farms in Melaka and Perak, with a total annual electricity generation of 63,771 MWh that was then sold to Tenaga Nasional Berhad (TNB). Compared to solar, mini-hydro and biomass projects were much more limited in number although the latter are increasing due to incentives provided by the Government.

TABLE 3. Approved Renewable Energy Projects in 2019 (MIDA, 2019)

RE source	No. of projects	Cost
Solar Energy	330 projects	RM2.10 billion
Solar self-consumption	314 projects	RM413.35 million
Large scale solar	16 projects	RM1.69 billion
Mini-hydro	6 projects	RM1.52 billion
Biomass	1 project	RRM6.58 million

The government continues to make green adoption a priority by extending the Green Investment Tax Subsidy (GITA) for the purchase of green technology assets and the Green Income Tax Exemption (GITE) for the use of green technology services until 2023. Solar leasing activities were aimed to increase participation in the Net Energy Metering Program (NEM) initiated by the Sustainable Energy Development Agency (SEDA) as part of the ongoing efforts for the National Renewable Energy Policy.

RE TECHNOLOGY

Feed-in Tariff (FIT) is a mechanism under the National Renewable Energy Policy and Action Plan that aims to promote renewable energy generation up to 30 MW in Malaysia. The scheme allows electricity from locally produced renewable sources to be sold to power utilities at a fixed premium over a specified period. Based on the technologies summarized in Table 4, according to calculations, the total installed capacity of biomass was 104.45 MW, and the total installed capacity of renewable energy was 604.44 MW; biomass has a massive potential and accounts for 17.3% of the total installed capacity. As the world's largest producer of palm oil, Malaysia has huge potential resources for biomass. Biomass has advantages over other types of RE in terms of availability and large resources. In addition, this type of resource can be easily collected and stored, other than the relative abundance. Biomass potential in Malaysia can reach 2500 MW in the coming years.

The advantages of biomass energy are many, but there are also some disadvantages, including: biomass energy is not as efficient as fossil fuels, and some biofuels, such as ethanol, are relatively inefficient compared to gasoline. Various types of biofuels are blended with fossil fuels to increase its efficiency and suitability to be used in existing engines. On the other hand, the types of biomass used as the energy resource is also a very important factor. Fuels produced from food crops, although very popular especially as bioethanol in Brazil, are offsetting the global food supply. These crops also utilize large areas which should be used to ensure food security, rather than being used as fuel resource.

TABLE 4. Installed capacity (in MW) of commissioned RE installations (SEDA, 2019)

	Biogas (MW)	Agro-waste (MW)	Biomass (MW)	Biomass (Solid Waste) (MW)	Small Hydro(MW)	Solar PV(MW)	Total(MW)
2012	2	3.16	36.9	8.9	11.7	31.54	94.2
2013	3.38	3.2	0	0	0	106.94	113.52
2014	1.1	0	12.5	0	0	61.88	75.48
2015	0	5.4	13.8	7	6.6	60.33	93.13
2016	0	15.46	19.5	0	12	77.84	124.8
2017	0	22.54	0	0	0	38.65	61.19
2018	0	11.71	0	5.85	20	3.05	40.61
2019	0	1.5	0	0	0	0.01	1.51
Total	6.48	62.97	82.7	21.75	50.3	380.24	604.44

RENEWABLE ENERGY POLICIES

In Malaysia, SEDA is one of the foremost agencies that are committed to continuously and effectively promote and manage energy by the relevant available best practices and national energy management legislation. SEDA implements the following five policies to develop renewable energy sources to achieve the vision of 20% renewable energy mix by 2025.

TABLE 4. Overview of the objectives outlined in the National Renewable Energy Policy (SEDA)

Policy	No	Specific policies and objectives
National Renewable Energy Policy	1	• Implementing Enhanced Net Energy Metering (NEM) and Solar Leasing. • To increase RE contribution in the national power generation mix.
	2	• Implementing Large Scale Solar Program 3 (LSS3). • To facilitate the growth of the RE industry.
	3	• Implementing Non-Solar RE Projects. • To ensure reasonable RE generation costs;
	4	• Establishing RE facilitation Programs in SEDA. • To conserve the environment for future generations.
	5	• Enabling greater access to renewable energy sources. • To enhance awareness of the role and importance of RE.

In addition to the national renewable energy policy, there are other policies and regulations involving energy that are developed in Malaysia. Each of these policies have different objectives and visions to help developing the renewable energy prospects in Malaysia.

ASSESSMENT OF WIND ENERGY

There is very limited data on wind energy in Malaysia for the past ten years, because wind energy is not a popular option in Malaysia. According to Saberi et.al. (2019), Malaysia is located in an area with slower equatorial winds, and land and sea winds will affect the wind direction. In addition, the wind blows unevenly and changes monthly. Despite these challenges, the potential of wind energy is really good in Malaysia.

In this study, the offshore wind energy resources are derived through the evaluation method, which is divided into three categories: theoretical, technical, and practical offshore wind energy resources (Hashim et al. 2020). This endeavor was chosen as there is a lack of recent data on real-life wind energy data.

TABLE 5. Renewable energy policies in Malaysia

Policies and Initiatives	Description
Renewable Energy Act 2011	An Act to provide for the establishment and implementation of a special tariff system to catalyze the generation of renewable energy and to provide for related matters.
Sustainable Energy Development Authority Act 2011	An Act to provide for the establishment of the Sustainable Energy Development Authority Malaysia and to provide for its functions and powers and related matters.
Rules and regulations	Feed-in approval & Feed-in tariff rate Technical & operational requirements REPPA agreement Criteria for renewable resources Allocation form electricity tariffs Recovery of funds by distribution licensee Administrative fees
Other related fiscal incentives	Financial incentives for green technology as announced under RMKe-12 Green Technology Financing Scheme 2.0 (GTFS 2.0)

Assessment of Theoretical Offshore Wind Data

Inverse Distance Weighting (IDW) is a deterministic method for multivariate interpolation using a set of known discrete points. Assignment to an unknown point is calculated using the weighted average of the available values at the known point. Figure 3 shows the annual wind energy generated based on ArcMap 10.5 software through the implementation of grid interpolation with IDW function (Hashim et al. 2020).

The annual wind energy is calculated from the wind speed of the satellite altimeter alone, without considering any parameters related to wind turbines. According to Figure 2, the darker blue shows the region with the highest wind capacity in the central part of the South China Sea, cor est pot

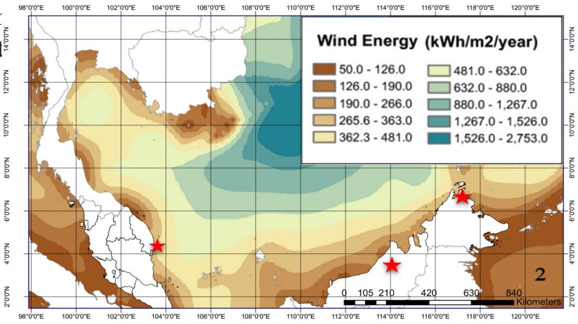

FIGURE 2. Theoretical offshore wind energy map of Malaysia (2001to 2010)

By limiting the distance from the economic zone to the coast, Terengganu, Sarawak, and Sabah were identified as areas with potential wind energy resources and annual wind energy averaged over 300 kWh/m^2/year. Based on the annual wind speed of the 10-year multi-mission satellite altimetry, the two main monsoon seasons are southwest and northeast (Hashim et al. 2020). The average speed during the northeast monsoon is 6 to 8 m/s, while the average annual wind speed in the southwest monsoon is less than 6 m/s. The average annual wind speed is obtained from the average monthly altimetry wind speed. The average annual wind speed is 5.36 m/s in Terengganu, 5.15 m/s in Sarawak and 5.17 m/s in Sabah (Hashim et al. 2020). This indicated that the potential for wind energy is very good for Malaysia.

TECHNICAL ESTIMATION OF OFFSHORE WIND ENERGY

Based on the technical characteristics and performance of several wind turbines on the market, six different wind turbines were compared and the technical and theoretical energy of wind energy in Sabah was calculated. It can be seen from the results that the theoretical energy value is much larger than the technical energy value which highlights the missed opportunity of not implementing wind energy in Malaysia.

Figure 3 below shows a comparison between the theoretical and technical offshore wind output of six selected turbines. Taking into account the characteristics of offshore wind turbines in terms of technology, the use of wind energy has been reduced by about 90%. According to the figure and CF, ATB 60.28DD wind turbine can be considered for wind farm development in Malaysia.

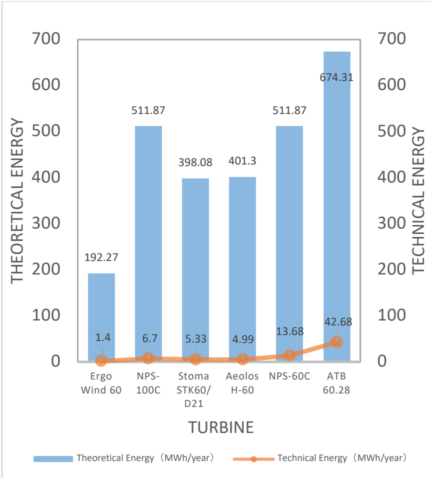

FIGURE 3. Comparison between theoretical and technical annual wind energy output in Sabah (MWh/year)
Source: Hashim et al. (2020)

In addition, considering the environmental impact and other factors, the use of wind energy consequently will allow a greener energy resource to be adopted. Therefore, based on these results, Terengganu, Sabah, and Sarawak have the highest potential for offshore wind power and the annual offshore wind energy is likely to be greater than 500 kWh/m^2. And among the six types of wind turbines, ATB 60.28DD can be considered for future wind farm development in Malaysia. However, it is noted that the development of wind farms has many other implications that must be considered before deployment such as the development cost, aesthetics, socio-economic impacts and the integration with the national grid.

Assessment of RE Processes

TABLE 6. Criteria and sub-criteria used in the model

Criteria	Sub-criteria	Description	Reference
Technical	Technology	Mature technology application	Haseeb et al. (2019), Tahrizian (2019)
	Equipment	Involved instruments	Chan et al. (2021), Haseeb et al. (2019)
	Innovation	Promote the energy transition	Pitelis et al. (2020), Saaty (1990)
Economic	Cost	Invested capital	Sreenath et al. (2020), Yatim et al. (2016)
	Market	Market demand	Ghazali & Ansari (2018), Henning et al. (2020)
	Tax	Taxes handed over to the country	Antonson et al. (2014), Kumar et al. (2018)
Environment	Requirement	Land area, suitable environment	Joshi (2018), Kardooni et al. (2018)
	Water flow/ usage	Demand and application of water	Sivapalan et al. (2017)
	Ecological environment	Positive or negative influences	Gu & Feng (2020), Lin & Zhu (2019)
Policy	Law	Rules that must be followed	Shen et al. (2020), Taherdoost (2017)
	Carbon rating	Up to standard carbon emissions	Dudin et al. (2019), Eder et al. (2018), Seddiki & Bennadii (2019)
	Policy	Government operation	Kåberger (2018), Usman et al. (2021)

In this study, the AHP method is used to develop and analyse the framework of renewable energy development through a combination of quantitative and qualitative indicators. According to the characteristics of this AHP methodology, the analysis and opinions of different journals are solicited, and the judgment matrix is finally constructed through summarization.

DETERMINATION OF CRITICAL ISSUES THROUGH AHP

In the AHP method, a multi-standard model is established to evaluate the specific renewable resources used for power generation in Malaysia. The four criteria identified are technical, economic, social, and policy. In addition, twelve sub-criteria have been identified that have a direct impact on the ranking of renewable energy sources. The selection of these major and secondary conditions are also supported by the literature. Table 6 summarizes the references referred to when developing the evaluation criteria. Through secondary data analysis, the information about renewable energy is analyzed. Table 7 listed the comparison matrix of technology, economy, environment, and policy criteria.

From these results, the critical issues for each criterion can be identified as shown by the highest value indicated in the right-most column, which is titled as Priorities Weight (PW). Through this assessment, carbon rating, technology, market, and ecological environment are the most important factors for the policy, technical, economical and environmental factors, respectively. The Consistency Ratio (CR) values are all less than 0.1. In summary, from all 12 factors selected based on the four criteria, the technology, equipment and ecological environment are three of the most important factors while policy is the least important factor. Another observation is the fact that the technical criteria is actually the most important factor in RE development in Malaysia, followed by the environmental factor, the economical factor and lastly is the policy.

TABLE 7. Comprehensive weight

Criteria	Critical issues	Weight	Total Weight
Technical (53.40%)	Technology	59.072%	0.315
	Equipment	33.382%	0.178
	Innovation	7.546%	0.040
Economical (18.97%)	Cost	22.987%	0.044
	Market	64.795%	0.123
	Tax	12.218%	0.023
Environmental (22.69%)	Land requirement	8.199%	0.019
	Water flow	23.645%	0.0534
	Ecological environment	68.156%	0.155
Policy (4.94%)	Law	17.414%	0.009
	Carbon rating	72.253%	0.036
	Policy	10.333%	0.005

DISCUSSION

First of all, in the beginning, it was thought that solar power was the most suitable for the development of Malaysia, but the results showed that hydropower accounted for the largest proportion of 0.384. In the process of this research, it was found that hydropower is the best developed renewable energy in Malaysia, and it is also the most mature. Next is biomass energy, which accounts for 0.279. Through the estimation data, Malaysia's biomass energy will reach 2,400 MW. With geographical and climatic advantages, biomass energy is also a powerful potential energy source. The third is wind energy. In the past, the development of wind energy was very limited due to variability and geographical reasons. However, according to theoretical data, the offshore wind energy in Malaysia is very rich, which highlights its potential to be developed. Malaysia is surrounded by the sea, and there are many offshore wind locations that can be selected, which may boost RE development. Unexpectedly, solar energy only accounted for a small portion of 0.166. The fact is that solar resources are available and consistently available in Malaysia, which are similar to the biomass energy. However, although real wind energy data is not available, the estimation demonstrated the potential of wind energy over solar energy.

Through the AHP analysis, it was shown that the critical factors can be identified from the many different factors that are available. This is important as any decision making will require decision makers to systematically weigh and decide on the best course of actions. Based on this study, from the 12 factors representing the breadth of the critical issues in deploying any RE resources in Malaysia, technology, equipment, market, and ecological environment are most important and must be carefully determined as a basis before decision-making. Therefore, before deciding to develop hydropower and biomass energy, we must overcome these issues and find corresponding solutions or strategies to promote the renewable energy power supply plan.

FRAMEWORK

Based on the results obtained, a new framework was developed for this study as shown in Figure 4. The primary objective of this framework was to assist decision-making in RE options. Therefore, the framework starts with identification of the problem, which is to screen variable renewable energy. Several criteria for decision-making are determined according to the specific circumstances of the problem. What is used here is economy, environment, policy, and technology. Then, the potential problems were analyzed according to the four standards.

For this approach, the degree of difficulty of the potential problems can be obtained through AHP analysis. The decision is made by combining the feasibility ratios of the four energy sources in identifying important potential problems. Then, execution of the plan is followed by progress monitoring, and reassessing the decision once any situation or problem arises until the most suitable renewable energy source is reached.

INSIGHTS

AHP is one of the decision tools used to select, allocate, evaluate, or benchmark new technologies. Although AHP has been used in a wide range of areas, previous studies have led to scenarios with different criteria, sub-criteria and renewable energy applicable to power generation prospects in Malaysia. This shows that the results of a single AHP study have limitations according to the characteristics of different energy sources.

Therefore, with the increasing demand for the development of renewable energy sources due to the decline of fossil fuels and the increase in their prices, it is necessary to develop a development framework which, in this case, is conducive to the sustainable development of the country's electricity supply.

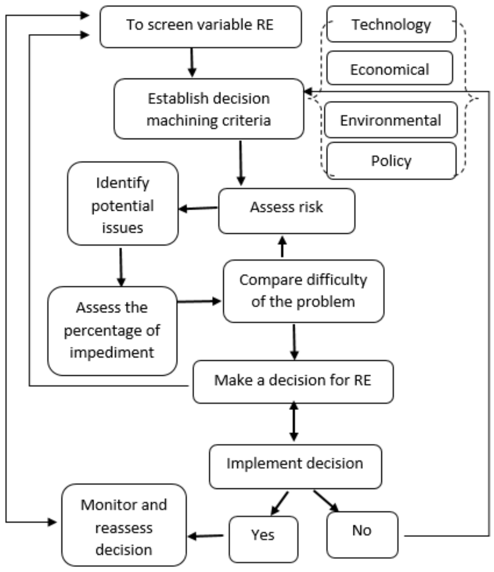

FIGURE 5. Framework developed for this study

The analytic hierarchy process is used to evaluate the power generation potential of four types of renewable energy in Malaysia. The weight and ranking of the total ranking are: hydropower (0.384) > biomass (0.279) > wind power (0.207) > solar energy (0.166). Based on this, Malaysia should focus on strengthening development of hydropower and biomass energy in power generation technology while developing wind and solar energy in a step-by-step and selective manner.

In addition, the weight and order of the criterion level relative to the target level obtained by the analytic hierarchy process is: technical level (53.40%) > environmental (22.69%) > economy (18.97%) > policy (4.94%). In terms of the environment, the development of renewable energy basically does not cause pollution to the environment, hence Malaysia is heading towards a good direction in developing renewable energy power supply and resources.

Therefore, when developing renewable energy, attention should be paid to technical proficiency and equipment guarantee, followed by the cost of development and utilization of the specific renewable energy chosen and lastly the economic efficiency.

CONCLUSION

As a conclusion, the objectives of this study were achieved. A decision-making framework was developed to assist selection of renewable energy options, and the critical issues before implementation has been identified based on the current selection.

The development of renewable energy has become a trend in the world's energy development. Renewable energy is closely related to Malaysia's national energy plan and sustainable development goals. At the core of the new energy industry, it is responding to the energy crisis, reducing environmental pollution, and promoting the economy. It is also of great significance for the comprehensive and sustainable development of society.

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DECLARATION OF COMPETING INTEREST

None

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