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A Survey on Renewable Energy Development in Malaysia: Current Status, Problems and Prospects

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***Abstract* – Energy demand in Malaysia is increasing over seven per cent a year, while forty per cent of the energy is supplied from conventional fossil fuel. However, a number of social barriers have mired the social acceptance of renewable energy among the users. This study investigates the current status of renewable energy, problems and future outlook of renewable energy in Malaysia. A total of 200 respondents were surveyed from Klang Valley in Malaysia. Majority of the respondents use energy to generate electricity. Although some respondents reported using solar energy, there is lack of retail availability for solar energy. The findings show that limited information on renewable energy technologies, lack of awareness, and limited private sector engagement emerged as major barriers to sustainable renewable energy development. In addition, the respondents suggest for increasing policy support from the government to make information more accessible to mass users, provide economic incentives to investors and users, and promote small-community based renewable energy projects. The study suggests that the government begin small scale projects to build awareness on renewable energy, while academically, higher learning institutions include renewable energy syllabus in their academic curriculum. The study concluded that to have sustainable renewable energy development, government's initiative, private sector engagement and users awareness must be given priority.**

***Keywords* – Renewable energy; Alternative energy; Malaysia; Attitude; Theory of planned behaviour**

1. INTRODUCTION

Green and alternative energy technologies are utilitarian concepts that have emerged from the growing need of energy. To preserve the ecological balance of this planet, a major invention has been to motivate the users towards renewable energy technologies. Social, regulatory and technical know-how are the three major problems hindering the process of conversion to alternative energy [1]. Studies on alternative energy in developed country examine users' attitude towards renewable energy in order to understand the barriers embedded in the socialisation of renewable energy [2]–[6]. As an emerging economic power, Malaysia has been investing a large amount in energy safety. During 1990–2007, energy supply has grown, on the average, at 7 % every year, of which, 40 % has been collected from fossil fuel. However, the contribution of renewable energy has been negligible [7]. About 36 % of energy comes from gas, 17 % energy sources from coal and biomass. Waste make up another 4 % energy and hydropower contributes to 3 % of the total energy consumption in Malaysia. More importantly, the website of the

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Department of Statistics' shows that Malaysia's export of conventional energy is around 30 % of their gross domestic product during 2007–2009, which is against the environmental safety principle of the country.

Social acceptance of renewable energy has been challenging for many users due to availability of less expensive energy alternatives. Apart from purely social fortune, households tendency towards new technology adoption is highly process oriented and a long-term dispute [8]–[10] because investment in renewable energy is expensive. New users only like to increase their energy budget not more than 5 % in many developed countries [6], [11]. It is still at the primary stage to comment on the success of the retail channels to make renewable energy available to mass users. Moreover, users lifestyle, level of awareness and ease of technology use are factors which influence rapid acceptance of renewable energy [12]. Studies on renewable energy in Malaysia extensively cover the technical and regulatory advancements of new technology for mass use (Table 1). Studies on social barriers and users' attitude towards renewable energy are yet to emerge in public domain. Therefore, users' experience with and their attitude towards renewable energy is yet to be rightly explored.

TABLE 1. A SUMMARY OF STUDIES ON RENEWABLE ENERGY IN MALAYSIA

Author(s)	**Topic**
(Sovacool & Bulan) [13]	Energy security and hydropower development in Sarawak, Malaysia.
(Ong, Mahlia & Masjuki) [14]	Energy pattern and policy for transportation sector in Malaysia
(Mekhilef et al.) [15]	Current state and prospects of solar energy in Malaysia
(Chua & Oh) [16]	Solar energy outlook in Malaysia
(Tye, Lee, Wan Abdullah & Leh) [17]	Bioethanol as an energy source in Malaysia
(Sovacool & Drupady) [18]	Small renewable energy power program in Malaysia
(Mohammed, Salmiaton, Wan Azlina, Mohammad Amran, Fakhru'l-Razi & Taufiq-Yap) [19]	Hydrogen rick gas from palm oil biomass as a potential renewable energy in Malaysia
(Poh & Kong) [20]	A policy analysis for renewable energy in Malaysia
(Hoi Why) [21]	Problems and prospects of biomass energy utilisation in Malaysia
(Mohd Noh) [22]	Renewable energy update in Malaysia

Malaysia's tropical-humid weather all year round makes it possible for Malaysia to explore solar energy opportunities [23]. Malaysian government has developed initiatives to encourage development of renewable energy, for instance, the government initiated Fit in Tariff (FiT) program to develop renewable energy use, which has taken place from year 2011 [24]. The Tenth Malaysia Plan (2011–2015) promotes the idea of energy efficiency in Malaysia and has put forward budgetary incentives for development of solar energy, palm-oil biomass and hydropower [23]. Chua and Oh [16] argue that such plans would help in developing alternative energy and assist in economic development in Malaysia.

However, studies summarised in Table 1 showed a sluggish progress from the eighth Malaysia plan (2001–2005) until the tenth Malaysia plan [25]. Sovacool and Drupady [18] explore a number of regulatory and social barriers with regard to the development on of small scale renewable energy in Malaysia. Among these barriers, community involvement, pricing versus tariff cost and lengthy approval process may involve created long-lasting dissatisfaction among the users' of renewable energy.

Renewable energy evolution is an outcome of the global awareness on green environmental. The first prudent attempt to restore greenness was to replace the use of plastic bags [26]. Gradually, biomass, waste management and community based small scale solar energy programs

have shaped the renewable energy today [18]. Recent attempts to renewable energy development involve construction of large hydro-electric plants and windmill projects. It is evident that renewable energy development has shifted quickly from merely engaging mass users, towards institutional production and profit making. Stephenson and Loannou [5] found that the growth of renewable energy solutions in many countries has been very sluggish due to lack of understanding about the life standard of the users. To motivate the use of renewable energy, green technology policy and green building index have been introduced in 2009 [27], [28]. Findings from studies show that the idea of energy efficiency award system and investment tax incentive to promote use of renewable energy are growing [29]. Conversely, we know very little about how individuals' feel when they consider sustainable renewable energy solutions. It is therefore, of significant importance to examine users' interest in this renewable energy initiative, problems and solutions for renewable energy development in Malaysia.

Adequate and unstoppable energy supply is at the core of economic development. Renewable energy has been touted to help reduce the use of fossil fuel, restore the green environment and to reduce the future uncertainty of energy supply. However, Gan and Li's study [30] have shown otherwise. Their projections report that Malaysia's energy consumption and carbon emissions will be triple by 2030, and energy import dependency will rise. They concluded with the urge for prudent government's regulation on green technology and environmental safety. This study argues that alongside regulatory and technical developments, it is of utmost importance to understand the users' attitude and practice of renewable energy technology. To reiterate, the current study, therefore, attempts to explain and examine the current status of renewable energy and problems with it, in Malaysia. The study ends with suggestions for sustainable renewable energy development in Malaysia.

2. EMPIRICAL DESIGN

The study aims at understanding the current user profile and energy practice, challenges to renewable energy development, and future prospects and way out for sustainable renewable energy development in Malaysia. A total of 200 household from the Klang valley in Kuala Lumpur, Malaysia participated in the study. It was difficult to get users of renewable energy. Extensive brainstorming sessions with experts from marketing research and renewable energy suggested that the snow-ball sampling is the best method. With this sampling method, respondents are selected based on references given by existing respondents [31]. However, to have diversity into the sample, the current study used multiple starting points in different parts of the Klang Valley. Thus, instead of starting with one reference point, the data collection started with different reference points and data is collected until the data reaches saturation in the responses. Finally, a total of 200 completed responses were gathered for further analysis. Table 2 displays the respondents' profile. Gorsuch [32] and Kline [33] suggested sampling at least 100 subjects. A sample size of 200 persons is recommended to be sufficient for data analysis [34].

Data used in this study were categorised into three major groups. There were questions on current renewable energy practices, which were followed by questions on major barriers to renewable energy development, and opinion regarding future prospects and challenges of renewable energy development. The survey questions is the form of structured interview protocol, with close ended and a combination of dichotomous and multichotomous questions. Analyses of the questions were conducted in two stages. A number of descriptive statistics were done, followed by mean-difference tests using Analysis Of Variance (ANOVA). As argued in Faiers and Neame [12], this study hypothesises that ethnic difference (i.e. Malay vs. others), size of establishment (i.e. number of room in the house) and amount of electricity consumption (in kilowatts per month)

posit differences in users current status of renewable energy use, problems with the energy use and solutions for renewable energy development.

3. DISCUSSION OF FINDINGS

3.1. Level of Interest, Awareness, Current and Future Use of Renewable Energy

Table 2 shows that over 70 % of the respondents were from Malay ethnicity. 57 % of the respondents had an establishment size of between 3–5 rooms in their houses. In total, around 90 % of the respondents had five rooms or less in their residence. Almost two third of the respondents (62 %) own a house while the remaining were tenants. 33 % of the respondents used below 500 kilowatts of electricity every month. However, nearly 87 % of the respondents reported that they used a range of 0–3000 Kilowatts of electricity. The profile elucidates that the respondents are mostly Malay households. Table 3 and 4 show the interests of the respondents' towards protecting the environment and their level of interest in renewable energy. On the average, 20 % of the respondents do not want to be penalised for causing harm to the environment. Similary another 20 % indicate that they have to think carefully before transforming themselves into supporters of renewable energy. Table 5 shows the reason behind this unfavourable acceptance.

Around 98 % of the respondents use a combination of electricity and gas for heating water at home. Thus, the lack of interest in renewable energy is Malaysia is primarily contributed by the lack of available technology for mass use.

TABLE 2. RESPONDENT PROFILE

Ethnic Origin			**Establishment size**		
	Freq.	%		Freq.	%
Malay	146	73.0	Below 3 Room	63	31.5
Chinese	27	13.5	3–5 Rooms	114	57.0
Indian	16	8.0	5–10 Rooms	17	8.5
Others	11	5.5	10–20 Rooms	1	.5
Total	**200**	**100.0**	More than 20 Rooms	1	.5
			Total	**196**	**98.0**

Average electricity use (kw/month)			**Occupancy of the house**		
	Freq.	%		Freq.	%
Below 500KWh	66	33.0	Owned	124	62.0
500–1000KWh	63	31.5	Rented	68	34.0
1000–3000KWh	45	22.5	**Total**	**192**	**96.0**
3000–5000KWh	10	5.0			
5000–10000KWh	8	4.0			
More than 10000 KWh	4	2.0			
Total	**196**	**98.0**			

Note: Missing Values were ignored, N = 200, Freq. = Frequency

Table 6 shows the level of awareness among respondents in Klang Valley. Around 20–25 % of the respondents are not alarmed by or aware of climactic and environmental changes which is taking place on the planet. Therefore, the lack of interest towards renewable energy is also contributed by lack of awareness in among nearly one third of the respondents.

Table 7 shows the current state of renewable energy use. 31 % of the respondents use solar nominal heating, 11 % use solar for space heating, 6.6 % use solar for pool heating and another 11 % use photovoltaic energy conversion from solar to electricity. Additionally, 16.2 % use thermal insulation for the house. It is evident from the data that respondents mostly use solar energy.

Table 8 shows that 54 % of the respondents in future would like to rely on energy sources created out of renewable energy. Table 7 and 8 provide important information on users' lifestyle and priority regarding renewable energy in Malaysia. The data points to the fact that the government and private organisation should keep users' life standard in mind when designing renewable energy technology for mass use.

TABLE 3. WAYS TO PROTECT ENVIRONMENT (% OF THE RESPONDENTS)

Ways	**Now**	***Later***	***Never***	**Total**
Use public transport than personal cars	70.0	24.5	9.5	100.0
Use environmentally friendly products	56.0	39.0	5.0	100.0
Practice recycling	77.5	17.0	5.5	100.0
Reducing wastage	73.5	23.0	3.5	100.0
Reduce the use of electricity	75.5	21.5	3.0	100.0
Pay higher taxes for environmental destruction	38.0	40.0	22.0	100.0
Participate in environmental safety	73.0	22.0	5.0	100.0

TABLE 4. LEVEL OF INTEREST IN RENEWABLE ENERGY

Level of Interest	**Frequency**	**%**
Very Little Interest	42	21.0
Average Interest	73	36.5
Very Much Interested	85	42.5
Total	200	100.0

TABLE 5. ENERGY USE FOR WATER HEATER

Methods	**Frequency**	**%**
Electricity	115	57.5
Gas	23	11.5
Electricity and Gas	50	25.0
Solar	3	1.5
Total	191	95.5
Missing	9	4.5
Total	200	100.0

TABLE 6. ARE YOU AWARE OF CLIMACTIC AND ENVIRONMENTAL CHANGES (% OF RESPONDENTS)?

Alarmed by	Yes	No	Don't Know	Total
Climate change	78.5	9.5	12.0	100.0
Animal extinctions	76.5	13.5	10.0	100.0
Pollution by human	84.0	7.0	9.0	100.0
Pollution by agriculture	71.0	18.5	10.5	100.0
Rapid Urbanisation	79.0	11.0	10.0	100.0
Increasing amount of waste	76.0	12.5	11.5	100.0
Obesity among people	76.5	12.5	11.0	100.0
Increase in transport flows	76.0	13.5	10.5	100.0

TABLE 7. CURRENT STATE OF RENEWABLE ENERGY USE

Type of Renewable Energy	Responses		Percent of Cases
	N	%	
Thermal insulation of the house	44	16.2 %	24.6 %
Solar for heat	84	30.9 %	46.9 %
Solar space heating	30	11.0 %	16.8 %
Attached greenhouse	51	18.8 %	28.5 %
Solar pool heating	18	6.6 %	10.1 %
Photovoltaic electricity generation	31	11.4 %	17.3 %
Geothermal hot water/space heating	4	1.5 %	2.2 %
Use of solid fuel with biomass content	10	3.7 %	5.6 %
	272	100.0 %	152.0 %

Note: includes multiple responses

3.2. Major Barriers to Renewable Energy Development

Respondents identified their level of support for various renewable energy technology developments (Table 9) and commented on barriers they faced during the decision of renewable energy use (Table 10). On average, more than 5 % of the respondents commented that they do not know about various energy technologies, which is why they are unable to support the use of renewable energy. The final column in Table 9 shows the total percentage of respondents' responses which are coded as strongly opposed, opposed and neutral. This column shows that another 30–40 % of the respondents either opposed or kept them aside from supporting. Lack of support from the respondents is perhaps contributed by the lack of awareness and access to information. Some of the factors which created barriers are presented in Table 10. Respondents selected lack of awareness and unfavourable cost as the two most important barriers (based on mean score). Limited private sector involvement, uneasy regulatory support from the government, limited social acceptance and unavailability of financial valuation information for user analysis were the other important factors.

One way ANOVA tests were conducted to examine whether the barriers were different among different categories of respondents. Null hypotheses means that each barrier is the same among the groups (such as among Malays, Chinese, Indians and others). Among the three categories, the

size of establishments, ethnicity and electricity usage based on average per month, the study found two barriers. They are size of establishment and electricity usage based on average per month. The use of electricity is statistically significant (see Table 11). ANOVA tests on barriers signals two major problems. Firstly, limited access to renewable energy information among the minority groups (the Malay population is majority, Chinese and Indians are minority). Secondly, customers with one of the highest usage of electricity (500–1000 kW per month) in the retail sector could not find suitable renewable technology for their use. These two results, therefore, have implications on policymakers. The result indicates that information should be made available to all the potential users of renewable energy. In addition, companies that invest to produce renewable energy technology should work closely with the government to introduce renewable energy technologies that are suitable for the targeted users. As argued in Faiers and Neame [12] Stephenson and Loannou [5] and Rogers et al. [35], renewable energy initiatives will fail unless the regulators and investors pay attention to community interest and lifestyle of the users.

TABLE 8. FUTURE PRIORITY FOR RENEWABLE ENERGY USE

Future use of Renewable Energy	**Responses**		**Percent of Cases**
	N	**%**	
Nuclear power plants	46	18.4 %	24.2 %
Power plants that rely on renewable energy	135	54.0 %	71.1 %
Natural gas power plants	57	22.8 %	30.0 %
Coal fired power plants	8	3.2 %	4.2 %
Others	4	1.6 %	2.1 %
	250	100.0 %	131.6 %

Note: includes multiple responses

TABLE 9. LEVEL OF SUPPORT FOR RENEWABLE ENERGY

Level of Support with	**SO**	**O**	**N**	**S**	**SS**	**Don't Know**	**SO +O +N**
Hydroelectric generation with a dam	2.5	7.0	20.5	38.5	22.5	9.0	30.0
Small hydroelectric on streams	1.0	7.5	29.0	35.5	18.0	9.0	37.5
Biomass/ Biodiesel	2.0	6.0	21.0	40.0	26.0	5.0	29.0
Wind energy	1.5	6.0	22.0	33.5	29.5	7.5	29.5
Solar thermal energy	1.0	2.5	17.0	33.0	40.5	6.0	20.5
Photovoltaic energy	1.0	3.0	22.0	33.0	34.0	7.0	26.0
Geothermal energy	2.0	3.0	30.0	35.0	19.0	11.0	35.0
Wood Energy	4.5	12.0	32.0	28.5	15.0	8.0	48.5
Oil Energy	3.5	9.5	33.5	30.0	18.5	5.0	46.5
Gas Energy	4.0	8.5	32.0	29.0	22.0	4.5	44.5

Note: rounded to 100 %; SO = Strongly Opposed, O = Opposed, N = Neutral, S = Supportive, SS = Strongly Supportive

TABLE 10. MAJOR BARRIERS TO RENEWABLE ENERGY DEVELOPMENT (% OF RESPONDENTS)

Items	SD	D	MD	MA	A	SA	Mean
Limited information on Renewable energy	5.0	10.5	14.5	23.5	32.5	14.0	4.08
Inadequate financing	1.0	6.0	15.0	31.5	34.0	12.5	4.27
Limited financial information (i.e. ROI)	1.0	4.5	17.5	30.5	34.0	12.5	4.28
Limited involvement of private sectors	1.0	5.5	15.0	29.5	35.0	14.0	4.33
Lack of awareness	2.0	8.0	10.5	25.0	29.5	25.0	4.45
Unfavorable costs, subsidies and energy prices	1.0	7.5	12.0	22.0	37.0	20.5	4.47
Lack of access to the technology	3.0	7.0	19.0	25.0	30.0	16.0	4.20
Lack of social acceptance	3.0	5.5	14.0	29.0	29.5	19.0	4.34
Lack of cost-benefit valuation	2.5	6.0	11.0	30.0	32.5	18.0	4.39
Unfavorable energy sectors policies	2.0	7.0	13.0	28.5	33.0	16.5	4.34

Note: rounded to 100 %, Mean is calculated in a total point of 6. SD = Strongly Disagree, D = Disagree, MD = Moderately Disagree, MA = Moderately Agree, A = Agree, SA = Strongly Agree

TABLE 11. ANOVA TEST ON BARRIERS

	Ethnicity			Electricity Consumption		
Items	P-value	Highest Mean	Mean Group	P-value	Highest Mean	Mean Group
Limited information on Renewable energy	0.054**	4.56	Chinese	.475	4.37	5000–1000 kWh
Inadequate financing	0.055*	4.81	Chinese	.828	4.62	5000–1000 kWh
Limited financial information (i.e. ROI)	.115	4.70	Chinese	.520	4.87	5000–1000 kWh
Limited involvement of private sectors	.386	4.62	Chinese	.746	4.62	3000–5000 kWh
Lack of awareness	.451	4.77	Chinese	.920	4.60	5000–10000 kWh
Unfavorable costs, subsidies and energy prices	.181	4.92	Chinese	.213	4.87	5000–1000 kWh
Lack of access to the technology	.197	4.62	Chinese	0.050**	4.50	500–1000 kWh
Lack of social acceptance	.212	4.70	Chinese	.552	4.50	3000–500 kWh
Lack of valuation of cost and benefits	.216	4.81	Chinese	.234	4.75	5000–1000 kWh
Unfavorable energy sectors policies	.355	4.66	Chinese	.732	4.62	5000–1000 kWh

Note: ** = Significant at 5 %, * = Significant at 10 %

3.3. Future Outlook and Policy Participation for Renewable Energy Development

The level of interest, awareness, lack of availability and limited access to information are the major barriers to effective renewable energy development in Malaysia. The respondents offered a number of solutions to enhance the socialisation process. Around 70 % of the respondents argue that introduction of a new renewable energy project will tremendously boosts up the level of local residences' awareness (Table 12). Hence, community based renewable energy development [35] is the choice among the respondents in Malaysia. However, there exist questions on the organisational and regulatory participation to successful renewable energy initiative. Table 13

reports that respondents place highest importance on government on where policy issues are concerned, while research institutes should be responsible on innovation of customer friendly renewable energy technology. Although the lowest importance was given to municipalities, the government has to bring in various changes to existing regulatory frameworks, community education programs and developing retail chains to enhance mass access to renewable energy technologies. The ANOVA tests (not reported here) on institutional priority based on ethnicity, size of establishment and average monthly use of electricity do not reveal any significant differences among the institutions.

TABLE 12. NEW PROJECT INCREASES LEVEL OF AWARENESS

Respondents' Opinion	**Frequency**	**Percent**
No Opinion	13	6.5
Disagree	6	3.0
Agree	112	56.0
Strongly Agree	48	24.0
Total	179	89.5
Missing	21	10.5
	200	100.0

TABLE 13. INSTITUTIONAL PRIORITY TO DEVELOP RENEWABLE ENERGY SECTOR (% OF RESPONDENTS)

Institutions	**No Priority**	**Average**	**Top Priority**
Government	5.0	22.0	73.0
Universities and Research Institutions	3.0	27.0	70.0
Private sector	5.0	38.0	57.0
Electric utilities department	3.0	42.0	55.0
Municipalities	4.0	58.0	38.0

Regulators have plenty of challenges in order to develop social acceptance of renewable energy in Malaysia. What are some of the areas that the government should take actions on for sustainable renewable energy development? Table 14 shows respondents' opinion regarding government's initiative. Roughly 70 % of the respondents think that the government should not be directly involved with renewable energy business, rather it should only assist in policies to clear up policy barriers. Similarly, the respondents do not want the government to demonstrate projects. These are clear evidences of the respondents' willingness to see more private sector investment and engagement into renewable energy development. More than 50 % of the respondents want the government to make information on renewable energy accessible by mass users. Nearly 40 % of the respondents require the government to penetrate academic curriculum to develop clear understanding among the youth. On top of all, the respondents want government's intervention. However, that intervention should not go beyond policy level. The government should make information available to mass users and let the private sector invest and manage renewable energy sector.

TABLE 14: GOVERNMENT INITIATIVE TO DEVELOP SUSTAINABLE RENEWABLE ENERGY SECTOR

Government should	**Responses**		**Percent of Cases**
	N	**Percent**	
Directly promote renewable energies	84	26.20 %	47.50 %
Support pilot demonstration project for different technologies	53	16.50 %	29.90 %
Place renewable energy into academic curriculum	71	22.10 %	40.10 %
Make information accessible by mass users	96	29.90 %	54.20 %
Not be involved with renewable energy	17	5.30 %	9.60 %
Total	321	100.00 %	181.40 %

Note: Includes multiple responses

4. CONCLUSION

Government, private sector and users need to face multi-dimensional social barriers to sustainable renewable energy development. At present, Malaysians mostly depend on conventional energy sources for electricity and other energy demands, which explains why the use of renewable sources is insignificant. The respondents identified four major issues. Firstly, there has to be sufficient regulatory and policy assistance starting from policies to motivate investment in renewable energy technology innovation, making information available to be accessed by mass users and creating conducive environment for private sector to capitalise in this sector. Similar to various studies conducted in the western contexts [5], [35], [36] a community based renewable sector development would be a good start. There exists lack of awareness among Malaysians regarding the benefits and challenges of renewable energies. As argued in Fredric [37], government and private sector investors can develop marketing programs to create awareness in communities to increase the use of renewable energies.

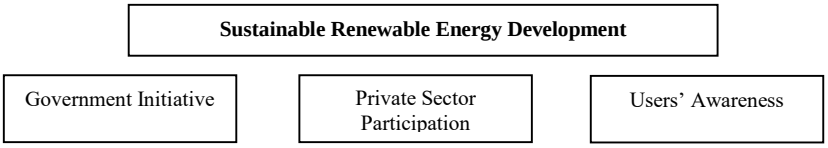

Fig. 1. Dimensions of Successful Renewable Energy Development in Malaysia.

The role of banks and financial institutions in arranging financing for renewable energy investment is crucial. Investment in renewable energy at the mass user level is quite expensive. Hence, West et al. [38] argued that government should offer economic incentives to investors and users of renewable energy technologies. Similarly, respondents in this study have also argued that lack of financial information and limited financing availability are major issues while deciding to transform conventional to renewable energy. However, similar to the western contexts [5], [6]. Malaysians are not ready to pay extra to save the environment. They do not like to see their tax burden increase because people are not using environmentally safe technologies. Therefore, the government has more challenges than those of the private sector and users of renewable energy. The respondents also supported small-scale renewable energy projects to be established locally to create awareness among the people. Most of the respondents in this study have been using solar energy for various purposes. Solar energy technologies are relatively easy to use. The government of Malaysia should place added importance to solar energy to initiate sustainable renewable energy development. Finally, the study reveals three dimensions of successful renewable energy development for Malaysia, as shown in Fig. 1.

REFERENCES

[1] Wüstenhagen R., Wolsink M., Bürer M. J. Social Acceptance of Renewable Energy Innovation: an Introduction to the Concept. *Energy Policy* 2007:35:2683–2691. doi:10.1016/j.enpol.2006.12.001

[2] Alam S. S., Hashim N. H. N., Rashid M., Omar N. A., Ahsan N., Ismail M. D. Small-scale households renewable energy usage intention: Theoretical development and empirical settings. *Renewable Energy* 2014:68:255–263. doi:10.1016/j.renene.2014.02.010

[3] Mallett A. Social acceptance of renewable energy innovations: The role of technology cooperation in urban Mexico. *Energy Policy* 2007:35(5):2790–2798. doi:10.1016/j.enpol.2006.12.008

[4] Richards G., Noble B., Belcher K. Barriers to renewable energy development: A case study of large-scale wind energy in Saskatchewan, Canada. *Energy Policy* 2012:42:691–698. doi:10.1016/j.enpol.2011.12.049

[5] Stephenson J., Loannou M. Social Acceptance of Renewable Electricity Developments in New Zealand. Centre for the Study of Agriculture, Food and Environment. University of Otago: Energy Efficiency and Conservation Authority, 2010.

[6] Zografakis N., Sifaki E., Pagalou M., Nikitaki G., Psarakis V., Tsagarakis K. P. Assessment of public acceptance and willingness to pay for renewable energy sources in Crete. *Renewable and Sustainable Energy Reviews* 2010:14(3):1088–1095. doi:10.1016/j.rser.2009.11.009

[7] Ahmad Fauzi H. Energy Efficiency and Renewable Energy in Malaysia. Energy Commission, 2009 [Online]. Available: www.teeam.com/st_paper_15july09.pdf

[8] Jacobsson S., Johnson A. The diffusion of renewable energy technology: an analytical framework and key issues for research. *Energy Policy* 2000:28(9):625–640. doi:10.1016/S0301-4215(00)00041-0

[9] Rogers E. M. Diffusion of Innovations. New York: Free Press of Glencoe, 1962.

[10] Straub E. T. Understanding Technology Adoption: Theory and Future Directions for Informal Learning. *Review of Educational Research* 2009:79(2):625–649. doi:10.3102/0034654308325896

[11] Dalton G. J., Lockington D. A., Baldock T. E. A survey of tourist attitudes to renewable energy supply in Australian hotel accommodation. *Renewable Energy* 2008:33(10):2174–2185. doi:10.1016/j.renene.2007.12.016

[12] Faiers A., Neame C. Consumer attitudes towards domestic solar power systems. *Energy Policy* 2006:34(14):1797–1806. doi:10.1016/j.enpol.2005.01.001

[13] Sovacool B. K., Bulan L. C. Energy security and hydropower development in Malaysia: The drivers and challenges facing the Sarawak Corridor of Renewable Energy (SCORE). *Renewable Energy* 2012:40(1):113–129. doi:10.1016/j.renene.2011.09.032

[14] Ong H. C., Mahlia T. M. I., Masjuki H. H. A review on energy pattern and policy for transportation sector in Malaysia. *Renewable and Sustainable Energy Reviews* 2012:16(1):532–542. doi:10.1016/j.rser.2011.08.019

[15] Mekhilef S., Safari A., Mustaffa W. E. S., Saidur R., Omar R., Younis M. A. A. Solar energy in Malaysia: Current state and prospects. *Renewable and Sustainable Energy Reviews* 2012:16(1):386–396. doi:10.1016/j.rser.2011.08.003

[16] Chua S. C., Oh T. H. Solar energy outlook in Malaysia. *Renewable and Sustainable Energy Reviews* 2012:16(1):564–574. doi:10.1016/j.rser.2011.08.022

[17] Tye Y. Y., Lee K. T., Wan Abdullah W. N., Leh C. P. Second-generation bioethanol as a sustainable energy source in Malaysia transportation sector: Status, potential and future prospects. *Renewable and Sustainable Energy Reviews* 2011:15(9):4521–4536. doi:10.1016/j.rser.2011.07.099

[18] Sovacool B. K., Drupady I. M. Examining the Small Renewable Energy Power (SREP) Program in Malaysia. *Energy Policy* 2011:39(11):7244–7256. doi:10.1016/j.enpol.2011.08.045

[19] Mohammed M. A. A., Salmiaton A., Wan Azlina W. A. K. G., Mohammad Amran M. S., Fakhru'l-Razi A., Taufiq-Yap Y. H. Hydrogen rich gas from oil palm biomass as a potential source of renewable energy in Malaysia. *Renewable and Sustainable Energy Reviews* 2011:15(2):1258–1270. doi:10.1016/j.rser.2010.10.003

[20] Poh K. M., Kong H. W. Renewable energy in Malaysia: a policy analysis. *Energy for Sustainable Development* 2002:6(3):31–39. doi:10.1016/S0973-0826(08)60323-3

[21] Hoi Why K. Biomass energy utilisation in Malaysia – Prospects and problems. *Renewable Energy* 1999:16(1–4):1122–1127.

[22] Mohd Noh D. Renewable energy update: Malaysia. *Renewable Energy* 1995:6(4):435–439. doi:10.1016/0960-1481(94)00070-M

[23] Mekhilef S., Saidur R., Safari A., Mustaffa W. E. S. B. Biomass energy in Malaysia: Current state and prospects. *Renewable and Sustainable Energy Reviews* 2011:15(7):3360–3370. doi:10.1016/j.rser.2011.04.016

[24] Ahmad S., Kadir M. Z. A. A., Shafie S. Current perspective of the renewable energy development in Malaysia. *Renewable and Sustainable Energy Reviews* 2011:15(2):897–904. doi:10.1016/j.rser.2010.11.009

[25] Hashim H., Ho W. S. Renewable energy policies and initiatives for a sustainable energy future in Malaysia. *Renewable and Sustainable Energy Reviews* 2011:15(9):4780–4787. doi:10.1016/j.rser.2011.07.073

[26] Jayaraman K., Haron H., Sung G. B., Lin S. K. Consumer reflections on the usage of plastic bags to parcel hot edible items: an empirical study in Malaysia. *Journal of Cleaner Production* 2011:19(13):1527–1535. doi:10.1016/j.jclepro.2011.03.019

[27] Oh T. H., Pang S. Y., Chua S. C. Energy policy and alternative energy in Malaysia: Issues and challenges for sustainable growth. *Renewable and Sustainable Energy Reviews* 2010:14(4):1241–1252. doi:10.1016/j.rser.2009.12.003
[28] Chua S. C., Oh T. H. Green progress and prospect in Malaysia. *Renewable and Sustainable Energy Reviews* 2011:15(6):2850–2861. doi:10.1016/j.rser.2011.03.008
[29] Manan Z. A., Shiun L. J., Alwi S. R. W., Hashim H., Kannan K. S., Mokhtar N., Ismail A. Z. Energy Efficiency Award system in Malaysia for energy sustainability. *Renewable and Sustainable Energy Reviews* 2010:14(8):2279–2289. doi:10.1016/j.rser.2010.04.013
[30] Gan P. Y., Li Z. An econometric study on long-term energy outlook and the implications of renewable energy utilization in Malaysia. *Energy Policy* 2008:36(2):890–899. doi:10.1016/j.enpol.2007.11.003
[31] Malhotra N. K. Marketing Research: An Applied Orientation, 5th ed. India: Pearson Education, 2008.
[32] Gorsuch R. L. Factor Analysis, 2nd ed. Hillsdale, NJ: Erlbaum, 1983.
[33] Kline P. An Easy Guide to Factor Analysis. New York: Routledge, 1994.
[34] Hair J. F. J., Anderson R. E., Tatham R. L., Black W. C. Multivariate Data Analysis, 5th ed. Upper Saddle River, New Jersey: Prentice Hall, 1998.
[35] Rogers J. C., Simmons E. A., Convery I., Weatherall A. Social impacts of community renewable energy projects: findings from a woodfuel case study. *Energy Policy* 2011:42:239–247. doi:10.1016/j.enpol.2011.11.081
[36] Rogers J. C., Simmons E. A., Convery I., Weatherall A. Public perceptions of opportunities for community-based renewable energy projects. *Energy Policy* 2008:36(11):4217–4226. doi:10.1016/j.enpol.2008.07.028
[37] Fredric C. M. Green electricity policies in the United States: case study. *Energy Policy* 2005:33(18):2398–2410. doi:10.1016/j.enpol.2004.05.011
[38] West J., Bailey I., Winter M. Renewable energy policy and public perceptions of renewable energy: A cultural theory approach. *Energy Policy* 2010:38:5739–5748. doi:10.1016/j.enpol.2010.05.024

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