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Public Acceptance of Renewable Energy in Malaysia: A NIMBY Approach

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ABSTRACT

Background: Renewable energy in Malaysia focused mainly in the big and modern city rather than small states like Perlis. So, renewable energy in Perlis is still new. Furthermore, SEDA (Sustainable Energy Development Authority) didn't focus on educating the local community in Perlis regarding renewable, whereas the renewable-energy project already existed in Perlis. This research will investigate the exposure of local communities in Perlis towards renewable energy through examining the public perception using NIMBY approach. The public opinion on renewable energy technologies was analyzed by means of a survey implemented in Perlis. Result show that NIMBYism still exists, although not felt by the immense bulk of the population. We can conclude that NIMBYism is not definitely an attitude shared by the majority (Ribeiro *et al*.,2013). Similarly to Jones *et al*, (2009), in this research also been addressed the NIMBYism between the comparison groups of gender, ages, level of education and type of occupations. Few respondents believe that renewable energy tend to raise the electricity bill. This survey proves that local community in Perlis is generally supportive of the growth of more renewable energy projects in the country and state.

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INTRODUCTION

Renewable energy is becoming major resources for the global electricity generation. The propensity to lean towards renewable energy is because it does not run out with use over time as compared with conventional energy. It produces little or no greenhouse-gas pollution of the environment. For nonrenewable energy such as coal, nuclear, natural gas and fossil-fuel and greenhouse gases and also contribute to high-maintenance of the modern era, the attention to be high-maintenance possibilities of utilizing renewable energy as part of the solution to produce and generate electricity for mass usage. During the year 2009, National Renewable Energy Policy and Action Plan were introduced in Malaysia. The policy vision is to enhance the utilization of indigenous renewable-energy resources to contribute to national electricity supply security and sustainable socioeconomic development. Malaysia is the second-largest oil and natural-gas producer in Southeast Asia. Figure 1.1 shows the primary energy consumption in which indicate that Malaysia too much relied on nonrenewable sources. According to this consumption, the government introduces an initiative in promoting and implementing the use of renewable energy as a substitute energy to oil, natural gas and coal.

Perlis lies on the northern part of the West Coast of Peninsular Malaysia. Perlis Indera Kayangan has a population of 227,025 as of 2010, and the state was estimated approximately 795 km2 squares. This smaller state of Malaysia naturally endowed with renewable-energy sources such as solar, wind, biomass and bio energy. Those energy resources produce little or no pollution or greenhouse gases, and they will never expire. Perlis known as the hottest state in Malaysia with the average 12 hours of sunlight received per day. Fig.2 shows the annual average solar radiation (MJ/m²/day) in Malaysia which show that Perlis are among the highest solar radiation in Malaysia.

Below are some of the projects of renewable energy in Perlis:

a) Renewable-Energy Solar Park, Kuala Perlis, Perlis:

The Renewable-Energy Solar Park, Kuala Perlis, is one of the largest renewable-energy projects in which solar energy has been used as the resource to ensure the sustainability of the environment. Cypark Resources Berhad is the

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company that holds a feed-in approval issued by the Sustainable Energy Development Authority (SEDA) Malaysia, and the holder is eligible to sell electricity from renewable resources. The project in Kuala Perlis focuses on Integrated Waste Management, which is transforming the sanitary landfill to the solar-energy plant. Cypark produces a groundbreaking model that generates electricity from two renewable resources (solar power and landfill bio gas) with the installation of 25MW of solar plants in Kuala Perlis. The electricity that will generate from the solar park will be sold to Tenaga Nasional Berhad (TNB) Perlis. According to the Cypark, they will organize a Corporate Social Responsibility (CSR) to the local community in Perlis in order to give exposure on renewable energy and promoting the solar park.

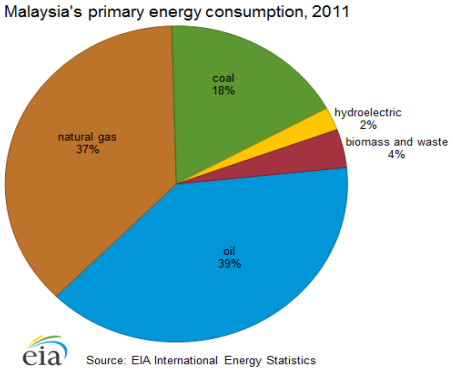

Fig. 1: Malaysia's primary energy consumption, 2011.

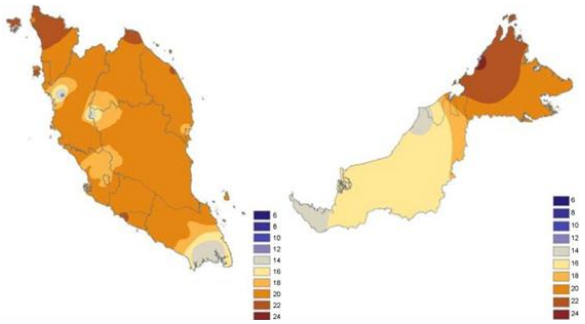

Fig. 2: Annual average solar radiation (MJ/m²/day).

b) Syngas Renewable Energy Conversion Plant in Perlis:

The plant being located in Sungai Batu Pahat, Perlis, The Research and development, plant of Syngas Sdn. Bhd has been set up since 2010, and it was initially conceived in 2008 at the Saham Utama factory in Selangor. It was a huge achievement for Syngas, endorsing the credibility of their processes and technology. Its core focus is to convert waste products into highly commercial renewable-energy products such as petroleum, diesel, kerosene, naphthalene, ethanol and methanol. During year in 2011, Syngas Sdn. Bhd, which is moving into green technology in Perlis develops a new plant in Batu Bertangkup. The main activity is producing diesel from plastic waste, and it makes Perlis the first state to produce diesel from plastic waste. Besides contributing to a cleaner environment with the reduction of plastic waste at waste disposal sites, the technology also helps better manage the burning of waste.

The Perlis government is embarking on two projects to boost the livelihood of 138 hardcore poor families throughout the state. The first involves the relocation of 118 families to an integrated solar harvesting and sustainable agricultural project in Batu Bertangkup, while the second involves a partnership with the Northern Corridor Implementation Authority (NCIA) that will benefit 20 families in Pauh. Koridor Utara | Newsroom. (2013, August 3). It retrieved August 26, 2014.

This research attempts to fill in the gaps of theoretical and practical implications. This research aims to apply the NIMBY concept and also the sustainable development issues that consist of economy, environmental and social into the community perception of renewable energy. Thus, the execution of those ingredients will be a contribution to the body of knowledge in research on public perception of renewable energy in Malaysia since past, researchers in Malaysia only relate public perception of renewable energy with popular theory such as willingness to pay for green energy.

Furthermore, the research area is focused more in urban areas in Malaysia rather than the rural area based on the previous study. In that respect, there is no solid framework built up by previous literatures that touch to public perception of renewable energy in Malaysia, this survey can be towards the consistency of knowledge of the development of renewable energy in Malaysia. Therefore, for practical implications, from the framework, it will be easy for the government to review the public opinion of renewable energy in Malaysia and to know what can be improved in the renewable-energy sector.

2. The Study Area:

A study boundary is defined to specify the geographical limit in order to represent the level of acceptance of renewable energy in Malaysia. Kuala Perlis, is the second largest town in Perlis was chosen as the study area. Furthermore, it is located the main port of Perlis in Malaysia. It is in extreme northwest Peninsular Malaysia, near the border with Thailand. The latest data from the year 2014, provided by Department of Statistics Perlis, the population Perlis is 265,408. Out of them, 129,917 are males and 135,491 are females. 265,408.Population in Kuala Perlis is about 24,485. The geographical location of Perlis is marked in figure 3.2.

Fig. 3: The equilateral triangle marks the location of Kuala Perlis.

Kuala Perlis was chosen as the study area for the following reasons. First, the authors wished to choose as a study area because there was located one of the largest renewable-energy solar park in Malaysia. The solar project in Kuala Perlis focuses on Integrated Waste Management, which transforming the sanitary landfill to the solar-energy plant. Therefore, the area will be suitable in order to investigate the public perception of renewable energy in Perlis in a way that it benefits the local community or not. Second, Kuala Perlis was chosen as study area based also on its potential of good economic growth since there was located the main port and ferry terminal. The energy sources utilized in Kuala Perlis are similar to those of other areas, being basically constituted from conventional power resources. This is because Tenaga Nasional Berhad (TNB), the main national utility in Peninsular Malaysia, supplies electricity to all sectors, including industrial and residential. In addition, due to existence of Renewable-Energy Park in Kuala Perlis, the electricities generated from the solar panel are purchased by Tenaga Nasional Berhad with the purchase power agreement about 21 years. Kuala Perlis, which consists of academic institutions, commercial centers, industrial factories and transportation systems, is foreseen to experience energy demand. Expansion of the energy mixture and sources has been predicted to solve the growing electricity demand.

3. Methodology:

3.1 The questionnaire:

A total of 400 questionnaires will be distributed to communities in Kuala Perlis, which are the targeted respondent in a survey conducted during the period from Jun 2014 to September 2014. . In this study, the simple random sampling was adopted in order to carry out this study in a way each item from the data (population) has the same probability of being selected in the sample. The random sampling ensured the representativeness of the samples and minimized the likelihood of bias.

The questionnaire for the research will contain six sections, specifically, Section A, Section B, Section C, D and E, Section A ask for the social demography of the respondents, which includes: 1. Gender 2. Age 3. Level of education 4. Occupation. Closed-ended questions will be used in Section A where respondents only have to choose from the list of categories attributed to them. Four items are listed to solicit data on the respondents' demography. Section B of the questionnaire comprises of items on the acknowledgement of renewable energy. This section will be used as filter question as if the respondent who does not pass the filter question, do not proceed to complete the questionnaire. Section B, C, D, E and F contain the assessment of the variables of this research. In section B until section F is measured by Likert-scale questions.

Section C measures the NIMBYism concept. For the sustainable development issues, it will be questioned in section D (Perception of costs), section E (perception of environmental impact) and lastly section F (perception of social impact on local population).

3.2 The samples:

As seen in the Appendix (Table 1) the sample size was determined when the number of population

was identified. Based on Krejcie and Morgan (1970) works in determining sample size for research activities, it is suggested that the appropriate sample size for about 24,485 for local communities is between 377 and 379. Therefore, in order to reduce the sampling error, the sample size will be 400 for this research. Random sampling will be used so that all the communities will have an equal chance to be selected as the research respondents (Frankfort-Nachmias & Nachmias, 2007).

Table 1: Sample Size Table.

Table for Determining Sample Size for a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
"S" is sample size.
Source: Krejcie & Morgan, 1970

RESULT AND DISCUSSION

4.1 Data analysis:

As shown in Fig.4, the sample of 380 respondents was largely formed by male with 52 % compare to female with 48%. During the pre - testing process it was also noted that males were more cooperative than female counterparts in sparing some more time to fill the questionnaire, and they seem more interested in this research topic compare to females. Next, young respondent with 67% aged around 20-30 year monopoly the sample population. The group with less involvement in the survey was aged 51 and above (6%). This is because of the youthful generation that works in the private or government sector and also as a student who actively involves giving cooperation in this research. This was also because Kuala Perlis is a common residential area for several university campuses nearby. Furthermore, because of the location, this may also explain why most of the respondents were undergraduates, 72% out of the total respondent comprises degree and diploma level.

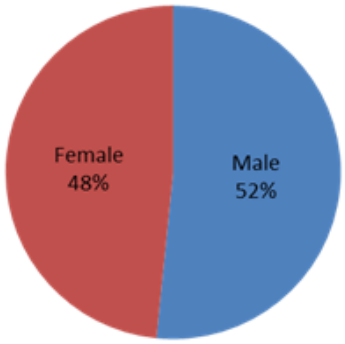

Fig. 4: Pie charts showing the gender of the respondents.

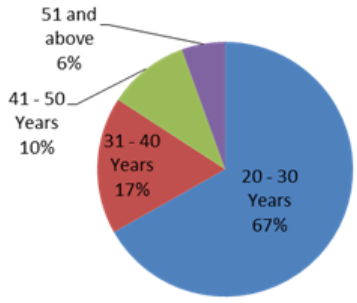

Fig. 5: Pie charts showing the age group of the respondents.

Among the 400 respondents who agreed to take the survey, there were 380 respondents who passed the filter question in which questioning on the acknowledgement of renewable energy. Non amazingly, most of the respondents were familiar with RE, recording 95% of the total sample. Most of them had heard about renewable technologies such as hydroelectric, solar power and wind power. This might be because most of the respondents were of a higher education degree. Hence, they had been trained and knew about the importance of RE as a donation to a sustainable energy scheme. This is imputable to the fact that higher education is the key component to attain RE goals (McKenzie, 2013), as a vital stage to inculcate awareness, cognition and the skills and values needed for a sustainable future (Cortese, 2003).

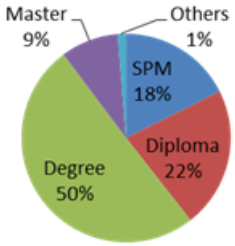

Fig. 6: Pie charts showing the level of education of respondents.

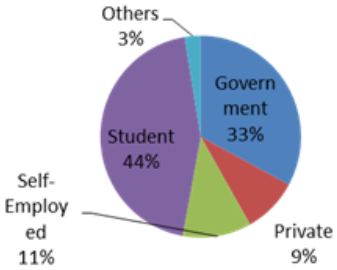

Fig.7: Pie charts showing the type of respondent's occupations.

4.2 NIMBYism:

For the NIMBYism, the researcher comes out with 2 questions, which can be seen in Table 2. NIMByism occurs if the respondent accepts that new projects throughout the country (Malaysia) but rejects them in their own backyards, state of Perlis. Given that 82.63 per cent of the local community does not contribute to NIMBY attitudes, only 17.37 per cent of a respondent had that kind of attitudes. We can conclude that NIMBYism is not definitely an attitude shared by the majority (Ribeiro *et al*.,2013). Similarly to Jones *et al*, (2009), in this research also been addressed the NIMBYism between the comparison groups of gender, ages, level of education and type of occupations. Some conclusions can be drawn on NIMBYism: By using an ANOVA test, no clear conclusions can be drawn between a level of education, gender, and ages towards NIMBYism because there's no significance between those variables. NIMBY ism has a significance difference between the type of occupation since the p-value = 0.00 which are lower than the alpha level of 0.05.

Table 2: Questions regarding NIMBYism

No	*(Statement)*	*(Totally Disagree)*	*(Tend to disagree)*	*(Tend to Agree)*	*(Totally Agree)*	Doesn'tKnow
1.	*More HYDRO/WIND/BIOMASS/SOLAR power plants should be built in our country.*	1	2	3	4	5
2.	*More HYDRO/WIND/BIOMASS/SOLAR power plants should be built in Perlis.*	1	2	3	4	5

Similarly to Jones and Eiser, in this research, for each respondent computation of this variable was the difference between NIMBY country (Malaysia) and NIMBY state (Perlis).

Example, if the respondent totally supports new projects in the country, but rejects them near his backyard. A negative number will indicate a PIMBY attitude ("place in my backyard") as in Swofford and Slattery. Note that if the respondent rejects the technology, both in the country and in the state, NIMBYism will be zero for this respondent.

Table 3: Test of NIMBYism.

NIMBY Positive (+)	NIMBY Negative (-) PIMBY (Please in MyBackyard)	NIMBY Zero (0)
17.37%	78.42%	4.21%

According to the table above, 78.42 percent of the respondents mostly have positive attitudes in which they support new renewable-energy project in the country in also the state which is Perlis. About 17.37 percent of a respondent contributes to the NIMBY attitude as they did not agree about supporting new renewable project in Perlis due to some factors like raises in electricity bill and pollutions. Respondents who rejected both new projects in Malaysia, and Perlis contribute only 4.21 percent. Somehow, maybe they have a lack of self-consciousness towards the development of renewable energy. The major conclusion can be drawn is that the attitudes of respondents are generally positive towards renewable energy in Perlis.

4.3 Perception on sustainable development issues:

Based on Table 4, almost half of the respondents agreed that renewable energy will raise the bill because due to the high-technology cost and also due to the high risk in investment in renewable energy. Among the socio-demographic data (gender, age, education and occupation), it was ages, level of education and type of occupation that explain the evaluation of acceptance on the economy. As for the environmental impact, based on Table 5, the highest percentage of respondents who are 51.6 percent agreed that the development of renewable energy in Perlis protects the environment slightly by reducing air, water and soil pollution. There were no significant relationships between socio-demographic data towards the environmental impact. As seen in Table 6, the highest percentage of respondents who are 49.5 percent agree that renewable-energy development slightly develops the local populations. The lowest percentage which is 2.1 percent stated that respondents give an opinion of renewable-energy development develop slightly the local population A chi-square test was performed and there was a significant relationship was found between ages and level of education toward the perception of social impact. The result showed that mostly the older respondents and higher education of respondents perceived that renewable energy will develop the local population.

Table 4: Frequency and percentage distribution of the respondents regarding perception of the economy effect of renewable energy in Perlis.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Lower Extremely The Bill	14	3.7	3.7	3.7
	Lower Slightly The Bill	14	3.7	3.7	7.4
	Has no Impact in The Bill	65	17.1	17.1	24.5
	Raises Slightly The Bill	173	45.5	45.5	70.0
	Raises Extremely The Bill	114	30.0	30.0	100.0
	Total	380	100.0	100.0	

Table 5: Frequency and percentage distribution of the respondents regarding perception on the environmental effect of renewable energy in Perlis.

	Frequency	Percent	Valid Percent	Cumulative Percent
Harm The Environment Considerably	11	2.9	2.9	2.9
Harm The Environment Slightly	7	1.8	1.8	4.7
Have No Environmental Impact	75	19.7	19.7	24.5
Protect the Environment Slightly	196	51.6	51.6	76.1
Protect the Environment Considerably	91	23.9	23.9	100.0
Total	380	100.0	100.0	

Table 6: Frequency and percentage distribution of the respondents regarding perception on social impact of renewable energy in Perlis.

	Frequency	Percent	Valid Percent	Cumulative Percent
Develop Considerably The Local Population	11	2.9	2.9	2.9
Develop Slightly The Local Population	8	2.1	2.1	5.0
Don't Develop nor Harm The Local Populations	77	20.3	20.3	25.3
Slightly Develop The Local Populations	188	49.5	49.5	74.7
Greatly Develop The Local Populations	96	25.3	25.3	100.0
Total	380	100.0	100.0	

5.0 Conclusions:

This research presents the results of a medium-scale survey implemented in Perlis aiming to access the opinion on renewable energy. The survey allowed to draw some conclusions on public acknowledgement of renewable energy, on NIMBY phenomenon, on the public perception towards costs, environmental impact and also social impact. To our knowledge, only a few studies have been done in Perlis concerning either NIMBYism or public acceptance of renewable energy. The survey was implemented at a state where this renewable energy was already implemented. The results demonstrate positive attitudes towards renewable energy. A NIMBY phenomenon is not yet very much accented. In general, the population in Perlis is aware of

renewable energy. The policy implications of the research are that the local community in general is supportive of the renewable energy, but the community also sensitive to the cost argument. Overall, the result from the study provides support for the model that researcher proposed. This study, therefore, has helped to fill this gap in an effort to improve understanding of renewable energy in Perlis and the public perception towards the technology. With the advent of globalization each year, greater knowledge of the implementation of renewable energy, specifically in the fast changing social and economy can be beneficial for accessing the strength relationship of the two variables. This study added important pieces of empirical evidence in literature on the public perception of renewable energy towards local community in Malaysia.

5.1 Limitations:

There are a number of limitations arise with the current investigation. Firstly, is the limitations in the cooperation's of a respondent. Some of the respondents don't cooperate in answering the questionnaire. Moreover, some of the returned questionnaire is not fully answered, many of its just answering only part A section regarding the demographic profile. Therefore, those questionnaires are considered as an unusable questionnaire in running the data. Secondly, the respondent might not diligently in answering the questionnaire or other term bias. As the research questionnaires require participants to give about the current scenario of renewable-energy projects in Perlis, the participants may not provide honest answers because participation afraid that the answer may be confidential to certain people. Even though effort and the clear clarifying the purpose of the study was made, there's some of the participants who refuse to answer the questionnaire because they felt that the question was too private for them. Thirdly, is sampling methods. The fact that this research focused on local communities in Kuala Perlis and this would include the rural area. Unfortunately, in rural area, older folks couldn't understand this kind of research, and researchers need to spend extra time to explain the questions one by one in order for them to give feedbacks regarding the questionnaire. Lastly, the main survey instrument for this study was using a questionnaire form. Therefore, the feedback given by the respondents was based on their interpretation on the item on the questionnaire. Respondents cannot answer others besides the prepared answers. Therefore, there are limitations in the accurate information and feedback from this study.

5.4 Suggestions and Recommendations:

Future research could look into extending the study population and to include collecting input from more experienced respondents who have better insight on the renewable-energy environment. By expanding the study population example, in all Malaysia, the data and the results from the research will be an important evidence and concurrently significant in identifying the social and economic effects of renewable energy towards Malaysian.

If the sample were drawn from a wider range of demographics, then the result may become more meaningful. Another possible future direction of study is to use more different measures of social and economic effects. Moreover, to obtain more accurate information and feedback from this study, more research can be carried out using unusual techniques such as interviewing and incorporating qualitative research technologies.

For the population, the major advantage of this study seems to be related to the local development and to cost and to a less extent of the positive environmental impacts. From the findings, the implications of renewable energy for the state and country development are little clearer. In order to improve the level of exposure on renewable energy among the community, community need to be educated by new policy or plan provide by government through programs that would be beneficial for them. By practicing the high exposure of renewable energy directly and indirectly toward Malaysian community it will positively affect the development of renewable energy in this country. If many new projects of renewable energy exist within the state, the investor should consider of providing other compensation schemes to the local community, including the creation of local jobs, local population rewarded with low energy bills or local part-ownership among others. The government should strengthen and streamline policy as well as a legal and institutional framework. Furthermore, the government should establish effective and sustainable funding mechanisms for renewable-energy projects and renewable-energy culture among Malaysian should be fostered. The outcomes from the study are expected to make important contributions to energy policy makers and investors. Nevertheless, the author realizes that these results can be volatile, changing over time and largely depending on the issues such as economic conditions and population experience. Future work can address towards the perception towards a different type of renewable-energy resources such as biomass, hydro, wind and solar or the direct assessment of the willingness to pay for renewable-energy resources.

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