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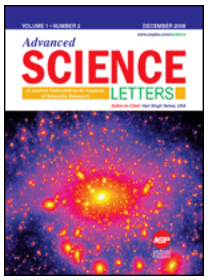

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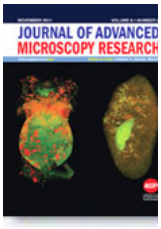

Challenge in Household Energy Conservation Program: Analysis from Socio-Demographic Factors

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A large proportion of Indonesia's electricity consumption is used by households. Indonesian electricity usage in household sector has been found covering 42.34% of total consumption and tend to increase in the future. Therefore, household has been identified as important target group for energy efficiency and conservation program. This paper explores the relationship between household electricity use and socio-demographic variables. The study was conducted among 2045 Indonesian households residing in five largest administrative regions for electricity consumers in Indonesia. Cluster sampling method was used to determine the number of sampling and the data analysis was done using Kruskal Wallis test. The results show that occupation was the main socio-demographic factors explaining variability in electricity consumption behavior at residential sector while other factors seemed have weaker correlation. These findings indicate that more comprehensive studies are needed on Indonesian household energy consumption behavior before designing energy efficiency scenarios for conservation policy.

Keywords: Electricity Consumption; Household; Policy; Socio-Demographics

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by Lusi Susanti

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RESEARCH ARTICLE

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Challenge in Household Energy Conservation Program: Analysis from Socio-Demographic Factors

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A large proportion of Indonesia's electricity consumption is used by households. Indonesian electricity usage in household sector has been found covering 42.34% of total consumption and tend to increase in the future. Therefore, household has been identified as important target group for energy efficiency and conservation program. This paper explores the relationship between household electricity use and socio-demographic variables. The study was conducted among 2045 Indonesian households residing in five largest administrative regions for electricity consumers in Indonesia. Cluster sampling method was used to determine the number of sampling and the data analysis was done using Kruskal Wallis test. The results show that occupation was the main socio-demographics factor explaining variability in electricity consumption behavior at residential sector while other factors seemed have weaker correlation. These findings indicate that more comprehensive studies are needed on Indonesian household energy consumption behavior before designing energy efficiency scenarios for conservation policy.

Keywords: Electricity consumption, household, socio-demographics, policy

1. INTRODUCTION

Indonesian government has set a long-term target to reduce energy intensity of at least 1% per year until 2025 [1]. In accordance with the national energy policy targets, it means the total energy consumption in 2025 has to decrease up to 50% with energy conservation scenario. It is therefore urgent for Indonesia to improve the efficiency of energy use and encourage energy conservation program. Household has been identified by researchers as an important target group of energy conservation. To illustrate, households account for 25% of the total energy consumption in the US, 26% in Japan, 50% in Saudi Arabia [2] and 38% in Brunei [3]. From the report of Indonesia Energy Outlook 2015 [1], the largest share of energy demand in 2013 was industry sector (37.17%) followed by household (29.43%), transportation (28.10%), commercial (3.24%), and other sector (2.04%). As the number of consumption by household sector is quite big thus it is responsible for household to take part in energy conservation program.

Electricity still dominates the final energy use in housing sector. The State Electricity Company (PT. PLN Persero) as the only electricity supplier company in Indonesia has sold 42.34 % of its total production to household sector in 2013; the largest share compared to other sectors like industry (33.19%), commercial (18,27%), and other sector (6.21%) [4]. Since Indonesia is

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one of the fastest growing and developing countries in Asia with a population over 250 million in 2015 then supported by an economic growth assumption of around 6-7% per year, has led an increase of demand on electricity consumption. The growth in demand for electricity is expected to reach 8.5% per year with population growth of 1.1% per year [4]. If this consumption persists and if no energy saving efforts or implementation of policies related to energy conservation and energy efficiency are undertaken, no doubt Indonesia will be struggling with energy sustainability.

In adopting an approach towards energy conservation and efficiency, it is pertinent that one understands how electricity is being used. The knowledge about how households utilize electricity could be used for directing initiatives to reduce electricity consumption. It has been a long time discussed on what specific factors might explain the way households consume and conserve energy in their homes. Achieving energy conservation is a twofold challenge, partly technical and partly human [5]. The development of technological innovations, especially those introduced to home appliances and home insulation has increased energy efficiency over the last decades. As massive appliances are more available in the market, the number of appliances used by households also increase resulting in counterbalancing initial efficiency efforts. Therefore, energy efficiency and conservation attempts would not succeed unless significant contribution from consumer behavior is taken into account.

The behaviorally based changes that reduce energy consumption have major advantages. First, the benefits can be very fast, unlike major infrastructure changes that can take years, or even decades. Second, they can be highly cost-effective. Third, they can provide savings and other benefits directly to citizens [6]. Since households can make a great contribution to energy conservation, in order to effectively encourage household energy-saving behavior, it is necessary to identify what drives household energy consumption and conservation in order to determine how these behaviors can successfully be shifted to the desired direction toward more efficient and sustainable practices.

Even though there has been a fast-growing body of literature examining energy-saving potential in relation to electricity energy, however, those empirical studies focused on evidence from Western context [7-10]. To fill this gap, the present paper aims to examine the potential of electricity saving in household sector seen from energy saving or energy wasting behavior in Indonesian context. Focus of the current paper is on the socio-demographic predictors which are believed as one of the key determinants in driving consumers toward energy conservation [11].

The purpose of this research is to gain more reliable data on how the current energy consumption pattern goes for households when socio-demographic predictors take as the main driving factors for energy consumption and what can be done in helping policy maker in this country in designing innovative energy saving instruments, standards, strategy and policy for household energy conservation program. Once it is understood then appropriate energy conservation policy would be easy to develop.

Table 1 Deployment of research samples

No	Regions	Number of samples			Total samples/ region
		1300 VA	2200 VA	3500-5500 VA	
1	DKI Jakarta dan Tangerang	261	100	50	411
2	Jawa Barat dan Banten	286	107	30	423
3	Jawa Timur	262	106	41	409
4	Jawa Tengah Dan Jogyakarta	257	111	34	402
5	Sumatera Selatan, Jambi, dan Bengkulu	352	38	10	400
Total Sampel		1418	462	165	2045

2. RESEARCH METHOD

2.1 Participants and procedure

Sample size in this study was determined by Cluster Random Sampling technique [12] and Slovin equation [13] was used to calculate number of samples from total of PLN consumers residing in the five biggest administrative regions for electricity consumers: 1) West Java and Banten, 2) East Java, 3) Central Java and Yogyakarta, 4) Metropolitan Jakarta dan Tangerang, and 5) South Sumatra, Jambi and Bengkulu. It was found that 2045 participants were willing to take part in the survey. The samples were then categorized into three different power capacity consumers: 1300 VA, 2200 VA and 3500-5500 VA. Table 1 shows deployment of the number of research samples.

The survey was focused on homeowners, as we lack critical information on rental units, and the type of rental contract -- net or gross -- which may have a substantial influence on energy consumption. Collecting data used door-to-door survey technique. This method was chosen rather than online survey because based on survey conducted by Pew Research Center in 2014, only about 24% of Indonesian society has access to internet and just about 15 percent have smartphones [14]. The sample would not be able to represent Indonesian population of PLN consumers if the online survey used for collecting the data. For the door-to-door survey, the authors hired paid representative agents acted as surveyors to record or even to copy any necessary document related to the research need. However, to minimize cost and time consumed, the surveyors were asked to input the questioner results online through an application developed using Google Form [15].

2.2. Questionnaire Design

Search on relevant literatures was carried out to decide the most appropriate variables from socio-demographic factor to be included in the questionnaire [16-18]. The questionnaire was validated by expert from PLN and communication expert from Andalas University to determine main predictors presumed to be the most related to Indonesian household characteristics. Those predictors are described in Table 2. The validated questionnaire was then distributed to 30 respondents as a pilot survey. Evidences from the result of pilot survey were then used

to justify whether the variables should be included, dropped, or even added into questionnaire for the second round of the survey. A new version of revised questionnaire was then used for the final (actual) survey.

The questionnaire consisted of two parts: personal background and electricity consumption behavior. The first part, the personal background, gives information about socio-demographic variables (Independent variables) consisting of gender (X_1), age (X_2), occupation (X_3), education level (X_4), household size (X_5), and monthly income (X_6). While, the second part of the questionnaire lists trigger factors of energy-saving behavior related to electricity consumption (Dependent variables), as explained below:

1. Behavior related to Knowledge (Y_1)

Most of the studies in energy use assumes that the public are aware of the amount and the type of energy used. In fact, most of the households do not really know what kind of energy they pay when using a number of tools to support their daily activities, due to the lack of information received. Basically, people need information in order to have knowledge about saving energy consumption. Consistent information through social interaction within the community is able to trigger an effective energy-saving behavior. So that, it is important to study further the knowledge of households in using electricity.

2. Behavior related to Curtailment Attitude (Y_2)

Most of the literature that discusses the energy savings in households suggests that there is a relation between attitudes and behavior. The influence of behavior is on micro-personal level. The government policies will not run properly if each individual does not align with their own policy. Individual attitudes in using the energy are triggered by socio-economic factors. In this study, behavior related to curtailment attitude can be investigated from the household ongoing day-to-day actions to reduce electricity use in the peak load hours, to discharge the electrical equipment when not in use, and to encourage energy saving habits to the family members [18].

3. Behavior related to Price of Energy (Y_3)

This research will investigate the response of the family member to the household electricity tariffs and the actions taken when electricity rates fluctuate.

4. Behavior related to Ability to Pay (Y_4)

Behavior related to ability to pay includes the actions of household when they get a rise in average earnings, such as replace broken lamps with energy efficient lights, buy more efficient appliances, etc.

Each item of questions of the dependent variables is examined to investigate the relationship between socio-demographic factor and electricity consumption behavior. Respondents were asked to rate how agree each aspect of the behavior was to them, on a scale from (1-strongly disagree to 4-strongly agree).

2.2. Data Analysis

The questionnaire analysis were performed using SPSS (version 20.0). The Kruskal Wallis test with 0.05 significance level was used to test the hypothesis of whether there is a relationship between a dependent variable (Y_n) and an independent variable (X_n). The hypothesis in this study are:

H_0: There is no relationship between variable X_n and variable Y_n

H_1: There is a relationship between variable X_n and variable Y_n

3. RESULTS AND DISCUSSION

Table 3 shows the socio-demographic data of surveyed participants. The table shows that the study involved more female participants compared than male participants. More than 80% of participants are under 50 years old. Sixty percent of participants have full-time job and more than half of them are university graduates. The table also shows that 32% of participants have total four person in their house and 75% of participants have monthly income between 1-10 million rupiah per month.

Table 4 shows the results of hypothesis test using Kruskal Wallis in investigating the relationship between socio-demographic characteristics and electricity consumption behavior. Null hypothesis will be rejected if the p-value < 0.05, which means that there is no relationship between the differences of variable X to the variable Y. Analysis results in Table 4 illustrate that some of the differences in the socio-demographic variables have significant relationship with the behavior of electricity consumption and detail explanation will be discussed below:

1. Gender

Gender has been found to only have correlation with energy consumption behavior related to the curtailment attitude ($p = 0.000$). Women in this study have strong concern about the curtailment attitude toward electricity energy saving than men but not for other three behavior variables. Some previous studies also indicated that as overall gender did not consistently emerge as statistically predictor of household energy use [19-21]. However, some research seems to see women exhibit more pro-environmental behavior than men [22]. In Indonesian culture, women are socially positioned as the main author to manage family needs and utilities. If they are equipped with sufficient information on energy conservation actions and behavior, it is expected that the role of women in saving electricity at home will be dominant.

2. Age

Related to the relationship between age differences and the behavior of electricity consumption, it was found that the differences in age variable had significant relationship with the behavior of electricity consumption related to the knowledge and attitude ($p = 0.023$ and 0003, respectively).

It is interesting to know that when people gets older, they possess better knowledge and then tend to behave more pro-environmental attitudes than younger people.

Table 2. Socio-demographic variables as the predictors of electricity consumption behavior in Indonesia

Predictors	Characteristics
Gender	a.Male b. Female
Age (years old)	a.18-30 b. 31-40 c. 41-50 d.51-60 e. 60
Occupation	a.Full time b. Part time
Education level	a.< =high school d. Master b.Undergraduate e. Doctor c.Diploma
Household size	a.1-2 persons d. 5 persons b.3 persons e. 6 persons c.4 persons f. >6 persons
Monthly Income (In Rupiah)	a.< 1 million d. 10-15 million b.1-5 million e. 15-20 million c. 5-10 million f. >20 million

Table 3. Socio-demographic data of surveyed participants

Predictors	Characteristics	Percentage
Gender	Male	47
	Female	53
Age (years old)	18-30	34
	31-40	18
	41-50	31
	51-60	16
	> 60	1
Occupation	Full time	60
	Part time	40
Education level	< =high school	28
	Undergraduate	50
	Diploma	13
	Master	7
	Doctor	2
Household size	1-2 persons	9
	3 persons	23
	4 persons	32
	5 persons	23
	6 persons	8
	> 6 persons	5
Monthly Income (In Rupiah)	< 1 million	1
	1-5 million	38
	5-10 million	37
	10-15 million	14
	15-20 million	5
	> 20 million	5

3. Occupation

Occupation, particularly the occupation of the head of the household, is found being the most significant predictor on household energy consumption behavior. The results demonstrate that the differences in the occupation variables had a significant relationship with the behavior of electricity consumption related to the knowledge,

Table 4. Kruskal Wallis Test Result of the Relationship between Socio-demographic Characteristics and Electricity Consumption Behavior (p-value)

Socio demographic Predictors	Electricity consumption behavior related to:			
	Knowledge	Curtailment Attitude	Price of Energy	Ability to Pay
Gender	0.106	**0.000**	0.991	0.978
Age	**0.023**	**0.003**	0.435	0.502
Occupation	**0.000**	**0.000**	**0.018**	0.125
Education	**0.002**	0.311	**0.001**	0.219
Household Size	0.362	0.142	0.636	0.539
Income	**0.000**	0.072	0.599	**0.000**

attitude, and price of energy. Full-time workers have a better knowledge about the electricity peak load time, the energy saving patterns, and the availability of energy-efficient appliances, compared than the part-time workers. It supports the study by Powers [23] stating that work affects the individual level of knowledge because the work is closely related to social interaction and cultural factors, while social interaction and culture is closely related to the process of information exchange.

The differences in the occupation variables was also associated significantly with the behavior of electricity consumption related to the attitude. Full-time workers have better adherence to the government policies on energy saving than part-time workers. It is influenced by the social environment of the workplace. Full-time workers get more information about energy-saving patterns in the work environment, therefore they are familiarized to the energy-saving behavior.

Regarding the behavior of electricity consumption related to the price of energy, individual with different occupation characteristics will also has different actions to the fluctuations in energy prices. Full-time workers have more energy saving actions despite there are changes in the electricity tariffs. Full-time worker reduces power usage when electricity rates go up and not buy other electrical appliances even though electricity rates down.

4. Education level

The electricity consumption behavior is also determined by the education level. Individual with a higher level of education will have a better knowledge about the use of electricity. In addition, the education level is also very influential on energy prices. The results of this study support Ma [24] study, which found that a person's education level affects the level of knowledge about energy-saving electricity. The lower the education level, the lower the level of awareness to the energy savings.

5. Household size

Most of previous studies informed that total household energy consumption is positively related to family or household size and composition; such that larger families/households typically consume more energy compared to smaller families/households. This may be because larger households generally have greater energy demands and requirements (*i.e.*, more cooking, cleaning, washing, heating/cooling, *etc*.). While larger households tend to consume more energy overall, it is assumed that they may also make greater investments in energy efficiency measures, such as sharing of energy service among family members [25]. However, as opposed to energy consumption, the relationship between household size and energy conservation behavior is not correlated in this study. It means the larger the family size, the more difficult for them to conserve energy at home, unless the effects of other predictors can play significant role to promote energy conservation behavior.

6. Monthly income

Household income has correlation with electricity consumption behavior related to the knowledge and household income. It is found that middle-income families (monthly income 1-10 million/month) behave more energy conservation than lower or higher income families. As Indonesian household is dominated by middle income families, promote and encourage sufficient information, incentives and smart policy to this target group will result in powerful impact on energy conservation. On the other hand, higher income families normally have more disposable income to spend on energy thus this group is slightly unaware about energy bills resulting in less significant concern on energy conservation. Tax policy on energy use might be suitable to this type of income-based household.

5. CONCLUSION

This article has demonstrate the correlation between socio demographic factor and household energy consumption behavior related to knowledge, curtailment attitude, price of energy and ability to pay. It seemed only occupation had stronger correlation with household energy conservation behavior while other predictors were found medium or no correlation at all. Socio-demographic factor solely will not be sufficient to predict household energy saving behavior that determine energy consumption, therefore more comprehensive observations are needed for future research to draw empirical evidence in this sustainable issues.

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Challenge

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Challenge in Household Energy Conservation Program: Analysis from Socio-Demographic Factors

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A large proportion of Indonesia's electricity consumption is used by households. Indonesian electricity usage in household sector has been found covering 42.34% of total consumption and tend to increase in the future. Therefore, household has been identified as important target group for energy efficiency and conservation program. This paper explores the relationship between household electricity use and socio-demographic variables. The study was conducted among 2045 Indonesian households residing in five largest administrative regions for electricity consumers in Indonesia. Cluster sampling method was used to determine the number of sampling and the data analysis was done using Kruskal Wallis test. The results show that occupation was the main socio-demographics factor explaining variability in electricity consumption behavior at residential sector while other factors seemed have weaker correlation. These findings indicate that more comprehensive studies are needed on Indonesian household energy consumption behavior before designing energy efficiency scenarios for conservation policy.

Keywords: Electricity consumption, household, socio-demographics, policy

1. INTRODUCTION

Indonesian government has set a long-term target to reduce energy intensity of at least 1% per year until 2025 [1]. In accordance with the national energy policy targets, it means the total energy consumption in 2025 has to decrease up to 50% with energy conservation scenario. It is therefore urgent for Indonesia to improve the efficiency of energy use and encourage energy conservation program. Household has been identified by researchers as an important target group of energy conservation. To illustrate, households account for 25% of the total energy consumption in the US, 26% in Japan, 50% in Saudi Arabia [2] and 38% in Brunei [3]. From the report of Indonesia Energy Outlook 2015 [1], the largest share of energy demand in 2013 was industry sector (37.17%) followed by household (29.43%), transportation (28.10%), commercial (3.24%), and other sector (2.04%). As the number of consumption by household sector is quite big thus it is responsible for household to take part in energy conservation program.

Electricity still dominates the final energy use in housing sector. The State Electricity Company (PT. PLN Persero) as the only electricity supplier company in Indonesia has sold 42.34 % of its total production to household sector in 2013; the largest share compared to other sectors like industry (33.19%), commercial (18,27%), and other sector (6.21%) [4]. Since Indonesia is

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one of the fastest growing and developing countries in Asia with a population over 250 million in 2015 then supported by an economic growth assumption of around 6-7% per year, has led an increase of demand on electricity consumption. The growth in demand for electricity is expected to reach 8.5% per year with population growth of 1.1% per year [4]. If this consumption persists and if no energy saving efforts or implementation of policies related to energy conservation and energy efficiency are undertaken, no doubt Indonesia will be struggling with energy sustainability.

In adopting an approach towards energy conservation and efficiency, it is pertinent that one understands how electricity is being used. The knowledge about how households utilize electricity could be used for directing initiatives to reduce electricity consumption. It has been a long time discussed on what specific factors might explain the way households consume and conserve energy in their homes. Achieving energy conservation is a twofold challenge, partly technical and partly human [5]. The development of technological innovations, especially those introduced to home appliances and home insulation has increased energy efficiency over the last decades. As massive appliances are more available in the market, the number of appliances used by households also increase resulting in counterbalancing initial efficiency efforts. Therefore, energy efficiency and conservation attempts would not succeed unless significant contribution from consumer behavior is taken into account.

The behaviorally based changes that reduce energy consumption have major advantages. First, the benefits can be very fast, unlike major infrastructure changes that can take years, or even decades. Second, they can be highly cost-effective. Third, they can provide savings and other benefits directly to citizens [6]. Since households can make a great contribution to energy conservation, in order to effectively encourage household energy-saving behavior, it is necessary to identify what drives household energy consumption and conservation in order to determine how these behaviors can successfully be shifted to the desired direction toward more efficient and sustainable practices.

Even though there has been a fast-growing body of literature examining energy-saving potential in relation to electricity energy, however, those empirical studies focused on evidence from Western context [7-10]. To fill this gap, the present paper aims to examine the potential of electricity saving in household sector seen from energy saving or energy wasting behavior in Indonesian context. Focus of the current paper is on the socio-demographic predictors which are believed as one of the key determinants in driving consumers toward energy conservation [11].

The purpose of this research is to gain more reliable data on how the current energy consumption pattern goes for households when socio-demographic predictors take as the main driving factors for energy consumption and what can be done in helping policy maker in this country in designing innovative energy saving instruments, standards, strategy and policy for household energy conservation program. Once it is understood then appropriate energy conservation policy would be easy to develop.

Table 1 Deployment of research samples

No	Regions	Number of samples			Total samples/ region
		1300 VA	2200 VA	3500-5500 VA	
1	DKI Jakarta dan Tangerang	261	100	50	411
2	Jawa Barat dan Banten	286	107	30	423
3	Jawa Timur	262	106	41	409
4	Jawa Tengah Dan Jogyakarta	257	111	34	402
5	Sumatera Selatan, Jambi, dan Bengkulu	352	38	10	400
Total Sampel		**1418**	**462**	**165**	**2045**

2. RESEARCH METHOD

2.1 Participants and procedure

Sample size in this study was determined by Cluster Random Sampling technique [12] and Slovin equation [13] was used to calculate number of samples from total of PLN consumers residing in the five largest administrative regions for electricity consumers: 1) West Java and Banten, 2) East Java, 3) Central Java and Yogyakarta, 4) Metropolitan Jakarta dan Tangerang, and 5) South Sumatra, Jambi and Bengkulu. It was found that 2045 participants were willing to take part in the survey. The samples were then categorized into three different power capacity consumers: 1300 VA, 2200 VA and 3500-5500 VA. Table 1 shows deployment of the number of research samples.

The survey was focused on homeowners, as we lack critical information on rental units, and the type of rental contract -- net or gross -- which may have a substantial influence on energy consumption. Collecting data used door-to-door survey technique. This method was chosen rather than online survey because based on survey conducted by Pew Research Center in 2014, only about 24% of Indonesian society has access to internet and just about 15 percent have smartphones [14]. The sample would not be able to represent Indonesian population of PLN consumers if the online survey used for collecting the data. For the door-to-door survey, the authors hired paid representative agents acted as surveyors to record or even to copy any necessary document related to the research need. However, to minimize cost and time consumed, the surveyors were asked to input the questioner results online through an application developed using Google Form [15].

2.2. Questionnaire Design

Search on relevant literatures was carried out to decide the most appropriate variables from socio-demographic factor to be included in the questionnaire [16-18]. The questionnaire was validated by expert from PLN and communication expert from Andalas University to determine main predictors presumed to be the most related to Indonesian household characteristics. Those predictors are described in Table 2. The validated questionnaire was then distributed to 30 respondents as a pilot survey. Evidences from the result of pilot survey were then used

to justify whether the variables should be included, dropped, or even added into questionnaire for the second round of the survey. A new version of revised questionnaire was then used for the final (actual) survey.

The questionnaire consisted of two parts: personal background and electricity consumption behavior. The first part, the personal background, gives information about socio-demographic variables (Independent variables) consisting of gender (X_1), age (X_2), occupation (X_3), education level (X_4), household size (X_5), and monthly income (X_6). While, the second part of the questionnaire lists trigger factors of energy-saving behavior related to electricity consumption (Dependent variables), as explained below:

1. Behavior related to Knowledge (Y_1)

Most of the studies in energy use assumes that the public are aware of the amount and the type of energy used. In fact, most of the households do not really know what kind of energy they pay when using a number of tools to support their daily activities, due to the lack of information received. Basically, people need information in order to have knowledge about saving energy consumption. Consistent information through social interaction within the community is able to trigger an effective energy-saving behavior. So that, it is important to study further the knowledge of households in using electricity.

2. Behavior related to Curtailment Attitude (Y_2)

Most of the literature that discusses the energy savings in households suggests that there is a relation between attitudes and behavior. The influence of behavior is on micro-personal level. The government policies will not run properly if each individual does not align with their own policy. Individual attitudes in using the energy are triggered by socio-economic factors. In this study, behavior related to curtailment attitude can be investigated from the household ongoing day-to-day actions to reduce electricity use in the peak load hours, to discharge the electrical equipment when not in use, and to encourage energy saving habits to the family members [18].

3. Behavior related to Price of Energy (Y_3)

This research will investigate the response of the family member to the household electricity tariffs and the actions taken when electricity rates fluctuate.

4. Behavior related to Ability to Pay (Y_4)

Behavior related to ability to pay includes the actions of household when they get a rise in average earnings, such as replace broken lamps with energy efficient lights, buy more efficient appliances, etc.

Each item of questions of the dependent variables is examined to investigate the relationship between socio-demographic factor and electricity consumption behavior. Respondents were asked to rate how agree each aspect of the behavior was to them, on a scale from (1-strongly disagree to 4-strongly agree).

2.2. Data Analysis

The questionnaire analysis were performed using SPSS (version 20.0). The Kruskal Wallis test with 0.05 significance level was used to test the hypothesis of whether there is a relationship between a dependent variable (Y_n) and an independent variable (X_n). The hypothesis in this study are:

H_0: There is no relationship between variable X_n and variable Y_n

H_1: There is a relationship between variable X_n and variable Y_n

3. RESULTS AND DISCUSSION

Table 3 shows the socio-demographic data of surveyed participants. The table shows that the study involved more female participants compared than male participants. More than 80% of participants are under 50 years old. Sixty percent of participants have full-time job and more than half of them are university graduates. The table also shows that 32% of participants have total four person in their house and 75% of participants have monthly income between 1-10 million rupiah per month.

Table 4 shows the results of hypothesis test using Kruskal Wallis in investigating the relationship between socio-demographic characteristics and electricity consumption behavior. Null hypothesis will be rejected if the p-value < 0.05, which means that there is no relationship between the differences of variable X to the variable Y. Analysis results in Table 4 illustrate that some of the differences in the socio-demographic variables have significant relationship with the behavior of electricity consumption and detail explanation will be discussed below:

1. Gender

Gender has been found to only have correlation with energy consumption behavior related to the curtailment attitude ($p = 0.000$). Women in this study have strong concern about the curtailment attitude toward electricity energy saving than men but not for other three behavior variables. Some previous studies also indicated that as overall gender did not consistently emerge as statistically predictor of household energy use [19-21]. However, some research seems to see women exhibit more pro-environmental behavior than men [22]. In Indonesian culture, women are socially positioned as the main author to manage family needs and utilities. If they are equipped with sufficient information on energy conservation actions and behavior, it is expected that the role of women in saving electricity at home will be dominant.

2. Age

Related to the relationship between age differences and the behavior of electricity consumption, it was found that the differences in age variable had significant relationship with the behavior of electricity consumption related to the knowledge and attitude ($p = 0.023$ and 0003, respectively).

It is interesting to know that when people gets older, they possess better knowledge and then tend to behave more pro-environmental attitudes than younger people.

Table 2. Socio-demographic variables as the predictors of electricity consumption behavior in Indonesia

Predictors	Characteristics
Gender	a. Male b. Female
Age (years old)	a. 18-30 b. 31-40 c. 41-50 d. 51-60 e. 60
Occupation	a. Full time b. Part time
Education level	a. < =high school b. Undergraduate c. Diploma d. Master e. Doctor
Household size	a. 1-2 persons b. 3 persons c. 4 persons d. 5 persons e. 6 persons f. >6 persons
Monthly Income (In Rupiah)	a. < 1 million b. 1-5 million c. 5-10 million d. 10-15 million e. 15-20 million f. >20 million

Table 3. Socio-demographic data of surveyed participants

Predictors	Characteristics	Percentage
Gender	Male	47
	Female	53
Age (years old)	18-30	34
	31-40	18
	41-50	31
	51-60	16
	> 60	1
Occupation	Full time	60
	Part time	40
Education level	< =high school	28
	Undergraduate	50
	Diploma	13
	Master	7
	Doctor	2
Household size	1-2 persons	9
	3 persons	23
	4 persons	32
	5 persons	23
	6 persons	8
	> 6 persons	5
Monthly Income (In Rupiah)	< 1 million	1
	1-5 million	38
	5-10 million	37
	10-15 million	14
	15-20 million	5
	> 20 million	5

3. Occupation

Occupation, particularly the occupation of the head of the household, is found being the most significant predictor on household energy consumption behavior. The results demonstrate that the differences in the occupation variables had a significant relationship with the behavior of electricity consumption related to the knowledge,

Table 4. Kruskal Wallis Test Result of the Relationship between Socio-demographic Characteristics and Electricity Consumption Behavior (p-value)

Socio demographic Predictors	Electricity consumption behavior related to:			
	Knowledge	Curtailment Attitude	Price of Energy	Ability to Pay
Gender	0.106	**0.000**	0.991	0.978
Age	**0.023**	**0.003**	0.435	0.502
Occupation	**0.000**	**0.000**	**0.018**	0.125
Education	**0.002**	0.311	**0.001**	0.219
Household Size	0.362	0.142	0.636	0.539
Income	**0.000**	0.072	0.599	**0.000**

attitude, and price of energy. Full-time workers have a better knowledge about the electricity peak load time, the energy saving patterns, and the availability of energy-efficient appliances, compared than the part-time workers. It supports the study by Powers [23] stating that work affects the individual level of knowledge because the work is closely related to social interaction and cultural factors, while social interaction and culture is closely related to the process of information exchange.

The differences in the occupation variables was also associated significantly with the behavior of electricity consumption related to the attitude. Full-time workers have better adherence to the government policies on energy saving than part-time workers. It is influenced by the social environment of the workplace. Full-time workers get more information about energy-saving patterns in the work environment, therefore they are familiarized to the energy-saving behavior.

Regarding the behavior of electricity consumption related to the price of energy, individual with different occupation characteristics will also has different actions to the fluctuations in energy prices. Full-time workers have more energy saving actions despite there are changes in the electricity tariffs. Full-time worker reduces power usage when electricity rates go up and not buy other electrical appliances even though electricity rates down.

4. Education level

The electricity consumption behavior is also determined by the education level. Individual with a higher level of education will have a better knowledge about the use of electricity. In addition, the education level is also very influential on energy prices. The results of this study support Ma [24] study, which found that a person's education level affects the level of knowledge about energy-saving electricity. The lower the education level, the lower the level of awareness to the energy savings.

5. Household size

Most of previous studies informed that total household energy consumption is positively related to family or household size and composition; such that larger families/households typically consume more energy compared to smaller families/households. This may be because larger households generally have greater energy demands and requirements (*i.e.*, more cooking, cleaning, washing, heating/cooling, *etc.*). While larger households tend to consume more energy overall, it is assumed that they may also make greater investments in energy efficiency measures, such as sharing of energy service among family members [25]. However, as opposed to energy consumption, the relationship between household size and energy conservation behavior is not correlated in this study. It means the larger the family size, the more difficult for them to conserve energy at home, unless the effects of other predictors can play significant role to promote energy conservation behavior.

6. Monthly income

Household income has correlation with electricity consumption behavior related to the knowledge and household income. It is found that middle-income families (monthly income 1-10 million/month) behave more energy conservation than lower or higher income families. As Indonesian household is dominated by middle income families, promote and encourage sufficient information, incentives and smart policy to this target group will result in powerful impact on energy conservation. On the other hand, higher income families normally have more disposable income to spend on energy thus this group is slightly unaware about energy bills resulting in less significant concern on energy conservation. Tax policy on energy use might be suitable to this type of income-based household.

5. CONCLUSION

This article has demonstrate the correlation between socio demographic factor and household energy consumption behavior related to knowledge, curtailment attitude, price of energy and ability to pay. It seemed only occupation had stronger correlation with household energy conservation behavior while other predictors were found medium or no correlation at all. Socio-demographic factor solely will not be sufficient to predict household energy saving behavior that determine energy consumption, therefore more comprehensive observations are needed for future research to draw empirical evidence in this sustainable issues.

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	Total = (100%)	40				33,5
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