Study of the Amount of the Domestic Energy Consumption at Kolej Kediaman Pelajar UTHM Pagoh by Relating with Carbon Dioxide Emission and Its Implication to the Environment

Nuramidah Hamidon, Khalid Salleh, Mariah Awang, Mimi Suliza Muhamad

Abstract: Air pollution is closely related to the impact of global greenhouses emissions. In science context, Global warming is primarily a problem of too much carbon dioxide (CO_2) in the atmosphere, which acts as a blanket, trapping heat and warming the planet. As we burn fossil fuels like coal, oil and natural gas for energy, carbon accumulates and overloads our atmosphere. The carbon dioxide emission is closely related to the electric-charging sector due to the electricity-purging process as a result of combustion of coal, natural gas, oil and uranium. All these combustion processes will release carbon dioxide gas causing carbon dioxide gas to be the major contributor to global warming. Based on electricity generation in Malaysia, most processes involve combustion of fuel sources which is turn carbon dioxide emission into the air where the pollution occurs. The increases the demand for energy, the higher index of pollution causes of carbon dioxide emissions. Awareness among the community is needed to reduce energy consumption for the next generation. Therefore, this study is to know the uses of energy consumption of students in Kolej Kediaman Pelajar UTHM Pagoh (KKP) based on the daily average of electricity used. Subsequently the uses of the energy consumption will be exchanged in the form of the amount of carbon dioxide emission and it determined based on the energy used. Through the study, we are unconsciously exposed for how much energy that we spend and our contribution to air pollution based on energy consumption. In addition, if individuals are concern about their energy consumption, it also can reduce the rate of air pollution where carbon dioxide gas is released during power generation through charcoal combustion.

Index Terms*: *Keywords: Carbon Dioxide, Global Greenhouse Emissions, Global Warming, Energy Consumption.

I. INTRODUCTION

In science context, Global warming is primarily a problem of too much carbon dioxide (CO_2) in the atmosphere, which acts as a blanket, trapping heat and warming the planet. As we burn fossil fuels like coal, oil and natural gas for energy or cut down and burn forests to create pastures and plantations, carbon accumulates and overloads our atmosphere. Certain waste management and agricultural practices aggravate the problem by releasing other potent global warming gases, such as methane and nitrous oxide (Pachauri et al., 2014). Carbon dioxide survives in the atmosphere for a long time, up to many centuries so its heat-trapping effects are compounded over time. Of the many heat-trapping gases, carbon dioxide puts us at the greatest risk of irreversible changes if it continues to accumulate unabated in the atmosphere as it is likely to do if the global economy remains dependent on fossil fuels for its energy need (Pachauri et al., 2014). To put this in perspective, the carbon we put in the atmosphere today will literally determine not only our climate future but that of future generations as well.

The community now needs to be concerned about what happening in this environment nowadays, especially the usage of electricity by consumers. Based on electricity generation in Malaysia, most processes involve combustion of fuel sources which is turn releases carbon dioxide into the air where the pollution occurs. The increases the demand for energy, the higher index of pollution causes of carbon dioxide emissions. Efforts needed to reduce energy consumption among the community for the next generation. A user does not concern about energy wasted because they do not know higher energy production demand will come out negative implication air pollution.

II. LITERATURE REVIEW

The study focuses on environmental impact on the reduction of carbon dioxide emissions from energy generation plants.

This is due of carbon dioxide is one of the highest emissions of greenhouse gases in the air where it is like an air blanket that traps heat in the atmosphere and the occurrence of air pollution. carbon dioxide are significant to air pollution where the definition of air pollution is physical or chemical changes brought about by natural processes or human activities that result in air quality degradation (Cunningham et al., 2001).

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A. Scenario of Kyoto Protocol Related to Greenhouse Gas Emission

The greenhouse effect is a natural process whereby greenhouse gases trap heat energy in the atmosphere, thus causing it to warm. This helps to support the existence of life on Earth (EPA, 2016)(Lang., 2010). The enormous greenhouse gases (GHG) emission, especially carbon dioxide (CO_2), produced by human activities and their influence on climate conditions became a major ecological and political challenge. Concentration of GHG in atmosphere increased quickly over the past decades.). The effort to reduce emissions of greenhouse gases in the world though cooperation of the organization is to establish a Kyoto Protocol programmed.

The implementation of the KP is for one of the efforts to control the emission of gas house emissions in countries involved in the establishment of the programed, especially in developed countries. Basically, the effects of GHGs on human health have been referred to black carbon, ozone and sulphates [1]. Heart diseases, lung damage and asthma attack can be intensified by ground level ozone or so-call bad ozone [3]. Increasing the efficiency of power plants and alternative fuel application in power generation, renewable sustainable energy (RSE) employment, CO_2 capturing and carbon sequestration, biogas capturing from municipal solid waste, landfills and anaerobic digestions and biodiesel utilization in transportation and industrial sectors are the main preventive strategies for GHGs augmentation rate in Malaysia. Furthermore, suggestions for reducing emissions of greenhouse gases in term with the requirement of KP is adding numerous planting of palm trees [2].

B. Carbon dioxide emission in Malaysia

Carbon dioxide (CO_2) formation in fossil fuel combustion and its climate impaction has become the most important issues politically and scientifically. The rate of CO_2 generation has been increased rapidly during last 50 years [10][12]. Around 30 billion tons CO_2 release to the atmosphere through human activity annually (Safaai et al., 2011). The main contributors of emissions are coming from fuel combustion in manufacturing industries.

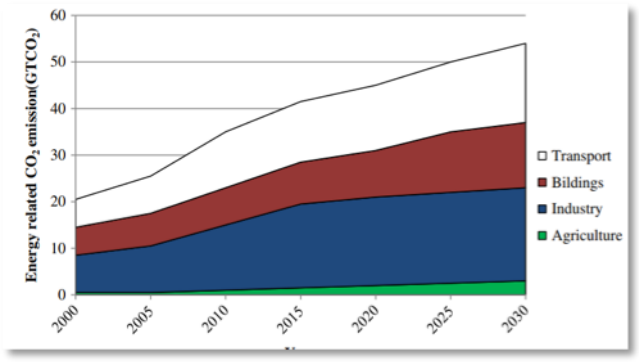

Fig. 1. Global rate CO_2 emission by end-use sectors from 2000 to 2030 [7].

There are several strategies that need to be implemented to reduce carbon emissions practiced by Malaysia. CO_2 capturing method and employing carbon sequestration, switching the fuel and application of alternative fuel especially biofuel and biogas and increasing the efficiency of the power plants are the best methods to approach low CO_2 emission in Malaysia (Hashim et al., 2005). Theoretical calculations confirm that by implementation of some strategies like raising thermostat set point of a refrigerators and air conditions and observing energy efficiency standards, the rate of GHGs can be declined in Malaysian household applications drastically [4].

Palm plantation and permanent forest have played crucial method role in CO_2 reducing in Malaysia. The rate of CO_2 removal was reported 167 million tons (Mt) and 82 Mt by forest and palm plantation respectively and they were still the main CO_2 removers for Malaysia up to now and the removal trend seems to continue in future because Malaysian government has adopted some strategies to increase the palm plantation in the future [5].

C. The Domestic Energy Consumption Influence to Consumers Purchase Intention for Energy-Efficient Household Appliances in Malaysia

The use of coal for electricity generation approximately increases 235% between 2000 and 2010 (Lean and Smyth, 2010). The world energy demand is growing at a rate of about 1.6% per year, and is expected to reach about 700 1018 J/year by 2030, with more than 80% of worldwide primary energy production still coming from combustion of fossil fuels (Pękala et al., 2010). Energy sector is a major contributor to climate change since consumptions of fossil fuels result in emissions of a large magnitude of greenhouse gas (GHG), while the increasing concentration of GHG in the atmosphere is likely to accelerate the rate of global warming (Chen et al., 2010). The concentrations of carbon dioxide (CO_2) in the atmosphere have been increased from approximately 280 ppm in 1750–367 ppm in 1999, while the global CO_2 emissions are expected to exceed 30 109 tons per year in the near future (Baede et al., 2001). The studies have been conducted on domestic consumers and the outcomes are consumers' attitude toward energy-efficient household appliances was found to have a positive relationship with consumers' purchase intention toward energy-efficient household appliances [8][9]. Hence, the result suggests that consumers who have favorable attitudes toward energy-efficient household appliances would generally intend to purchase such appliances and this finding was consistent with previous study [6].

III. METHODOLOGY/MATERIALS

A study conducted at Kolej Kediaman Pagoh at Universiti Tun Hussein Onn Malaysia (UTHM), HUB Education Pagoh, Jalan Panchor, 84600, Pagoh, Muar. Kolej Kediaman Pagoh have 9 blocks of student college building which is accumulate amount of 5000 students comprising the Faculty of Engineering Technology (FTK), Center of Diploma Studies (PPD) and the Faculty of Applied Science and Technology (FAST). In the field of study, the uses of electricity consumption in every home (Student College) will

be calculated and recorded through the aid of a Power Meter that allows every energy consumption from electrical appliances to be identified. One block of buildings consists of 20 houses, multipurpose rooms, felo office, sick room and a multipurpose room. Inside the house (college) there are 4 rooms where a room is occupied by 3 students. The table below shows electrical fittings on a college house:

Fig. 2. The building of Kolej Kediaman Pelajar UTHM Pagoh (KKP).

A. Electrical appliances in the Kolej Kediaman Pelajar UTHM Pagoh (KKP).

There are several places where electrical appliances are found as below:

1. Student house at ground floor until fourth floor.
2. KKP office at ground floor.
3. Exco activities room at ground floor.
4. Multipurpose room at ground floor.
5. Sick room at ground floor.
6. Entrance and corridor in every floor and stairs.

Table I: Type of electrical appliance found based on room function.

Area	Quantity	Type of electrical appliances	Number of student rooms	Total electrical appliance
Student house	3	Laptop	4	12
Student house	3	Hand phone charger	4	12
Student house	1	Domestic Printer paper	4	4
Student house	1	Table fan	4	4
Student house	1	Wall fan	4	4
Student house	2	Pendaflour lamp	4	8
Student house	2	Study lamp	4	8
Student house	1	Iron	1	1
Pantry space	2	Pendaflour lamp	1	2
Pantry space	1	Water heater	1	1
Toilet	2	Pendaflour lamp	1	2
KKP office	4	Computer desktop	1	4
Felo office	2	Printer	1	2
KKP office	10	Air conditioning	1	10
KKP office	21	Pendaflour lamp	1	21
Area	**Quantity**	**Type of electrical appliances**	**Number of student rooms**	**Total electrical appliance**
Exco activities room	2	Air conditioning	1	2
Exco activities room	4	Pendaflour lamp	1	4
Multipur pose room	3	Air conditioning	1	3
Multipur pose room	9	Pendaflour lamp	1	9
Sick room	1	Air conditioning	1	1
Sick room	5	Pendaflour lamp	1	5
Entrance and corridor	13	Pendaflour lamp	5	65

B. The Tool and Instrument Involved in Testing and Research Conducted.

Table show II: The tools are used in the testing in electrical appliances.

Tools	Features
	**Power Meter** • Calculating the power of each electrical appliances • Monitoring and testing instrument which determines the power consumption of an electrical appliances and cost of electric consumed. • It install with 3.6rechargeable batteries to store total electricity memory setting. • It show the electrical quantity display, frequency ,power factor, minimum power and maximum power and overload sign when the ampere is nearest or higher than 13ampere. • Technical specification: • Operation voltage : 230V, 50HZ • Operating current : maximum 13A • Wide voltage range : 230V – 250V • Wattage display : 0W – 2900W • Current display : 0.00A – 13.00A • Price display range:0 $kWH – 99.99 $kWH • Total KWh and cost display : 0 KWH – 9999 KWH

Test pen

- Used to check present of the electrical supply 240V.

Socket outlet and plug 13Amp

- Connected the wiring lamps and wall fans to ensure it can be plugged in with power meter.
- Install to the pendaflour lamp wall fan in the student room.

Connector Wire

- As a component to connect wire well and for safety connection but it only for temporary connection
- Pendaflour lamp and wall fan are connected with 13A socket are using the connector to making the temporary connection.

IV. RESULTS AND FINDINGS

A. Theoretical Measurement and Calculation

Theoretical measurements is comparing with data obtained from domestic consumers. The information of electrical appliances form is needed to be filled by consumers who are involved in the testing. The data is needed as reference for theoretical calculations based on the formula: Current (A) x Volt (V) =power (W).

a. Power (kW) x time operation (h) = work done/energy (kWh)
b. 1unit = 1kW
c. C = electricity tariff (RM)
d. Energy (kWh) x 1 x C = total amount to be paid (RM).
e. Energy(kW) x 0.503kg CO_2 = total amount of CO_2 emission

B. Overhaul of Energy Consumption and CO_2 in 1 Unit Block of Kolej Kediaman Pelajar UTHM Pagoh..

The results show from Table III below that student college give higher amount of energy consumption than other rooms. It can conclude that student college have more people than other rooms. Sick room shows no results which mean there is no person or people occupied the room during the experiment were done. The total energy consumption 1 block of Kolej Kediaman Pelajar UTHM Pagoh (KKP) building is 13324.14 kWh and contribute amount of 7289.05 kg of CO_2 emissions for 1 month consumption of electricity.

Table III: Total amount of energy consumption and CO_2 emissions.

Area	Energy consumption in:			CO_2 emissions in:		
	1 day /kWh	1 weeks /kWh	1 month /kWh	1 day /kg	1 weeks /kg	1 month /kg
Student college (20 unit of houses)	332.58	2328.06	9977.40	187.28	1310.96	5618.40
Felo office	62.54	312.70	1375.88	31.46	157.29	692.08
Sick room	0	0	0	0	0	0
Exco activities room	22.59	158.13	677.70	11.12	77.84	333.6
Multipurpose	13.258	92.806	397.74	13.258	45.21	193.77
room					3	
Entrance and corridor	29.90	209.30	897	15.040	105.28	451.20
Total	460.87	3101	13324.14	258.17	1696.58	7289.05

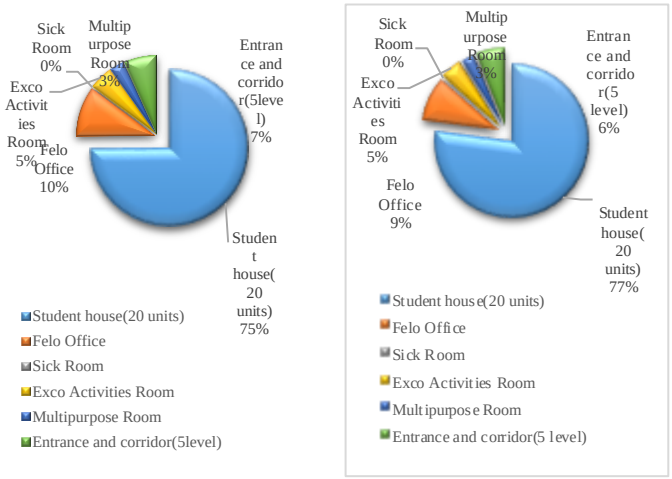

Fig. 3. The pie chart of energy consumption and CO_2 emissions percentage according to room function at the Kolej Kediaman Pelajar UTHM Pagoh(KKP).

4.30 Overhaul of energy consumption and CO_2 emission in 10 unit block of Kolej Kediaman Pelajar UTHM Pagoh building

The 18 blocks of buildings as shown in the table 1.40 above, 10 blocks were occupied by UTHM students in A1, A5, A10, A11, A12, A13, A14, A15, A16 and A17 blocks. However, there are 2 more residential blocks for UTHM students are no occupants. The scope of this study only covers the use of domestic electrical appliances at the UTHM Pagoh students' residential college as highlighted in the table. The total of domestic energy consumption and CO emissions by consumer in Kolej Kediaman Pelajar UTHM Pagoh as shown in table IV below:

Table IV. Overhaul of energy consumption and CO_2 emissions in 10 block of Kolej kediaman Pelajar UTHM Pagoh.

10 units block of Kolej Kediaman Pelajar UTHM Pagoh (KKP).	Energy Consumption	CO_2 Emissions
1 day	4608.70 kWh	2581.60 kg
1 week	31010 kWh	16965.80 kg
1 month	133241.40 kWh	72890.50 kg

V. CONCLUSION

Study done shows that Kolej Kediaman Pelajar UTHM Pagoh has spent 133241.40 kWh and contributes 72890.50 kg of CO2 emission per month. It means that the amount of CO_2 emissions will generate 874686 kg depend on the energy consumption for one year. It is not possible that the amount CO_2 emissions will increases every years based on energy consumption in the domestic appliances sector. This amount does not include energy usage in the industry sector.

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