



## **A Step towards Sustainable Society: The Awareness of Carbon Dioxide Emissions, Climate Change and Carbon Capture in Malaysia**

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### **ABSTRACT**

Public awareness is crucial to mitigate negative impacts on the environment. The aim of the study is to explore the level of public awareness in five states of Malaysia (Perak, Melaka, Johor, Pahang and Terengganu) regarding carbon dioxide (CO<sub>2</sub>) emissions, climate change and carbon capture and storage (CCS). A questionnaire floated for exploring public awareness regarding CO<sub>2</sub> emissions, climate change and CCS. Based on the questionnaire data was collected from five states (Perak, Melaka, Johor, Pahang and Terengganu) of Malaysia. These states were chosen on the basis of high concentration of heavy industries and plants, including petrochemical, natural gas processing, electricity generating, and cement plants. The study found that the public awareness of CO<sub>2</sub> emissions and climate change is high as compared to the level of awareness towards CCS, because some of the respondents have never/not heard about CCS. Furthermore, the study revealed that the respondents have several misperceptions about CO<sub>2</sub> emissions, climate change and CCS. Most of them only heard about CO<sub>2</sub> emissions, climate change and CCS only through print, electronic and social media. This study investigated public awareness about CO<sub>2</sub> emissions, climate change and CCS only in 5 states of Malaysia; however, in future the study could be extended and explored in all states of Malaysia. The findings offer significant implications for environmental policies and strategies in curbing the negative environmental impacts of CO<sub>2</sub> emissions in Malaysia as a whole.

**Keywords:** Public Awareness, Carbon Dioxide Emission, Climate Change, Carbon Capture and Storage, Malaysia

**JEL Classifications:** L13, Q32

### **1. INTRODUCTION**

There is a strong consensus in past studies that showed global temperatures have rose in the last few decades. The trend is caused mainly by the emissions of greenhouse gases (GHG). Since 1980s, global warming remains an issue of widespread political debate, especially in the developed countries in the United States and Europe. Unsustainable industrial development is one of the main causes that have stamped a lot of damage to the environment (Ghazali and Zahid, 2015). Evidently, economic losses from the natural disasters like extreme weather-related events keep on increasing at an alarming rate. Developing

countries with intentions to achieve developed status are facing large extent of pollutions from the transportation, industries, power stations and even chlorofluorocarbons. Consequently, with the economic development countries have higher environmental damages and resource depletion. Emphasize the importance of the issue; increasing attention has been placed to reduce the environmental threats. The governments and pressure groups have been campaigning vigorously to eradicate these negative impacts and ensure the environmental quality. Global warming, climate change, carbon dioxide (CO<sub>2</sub>) emissions, water scarcity, energy crises, biodiversity losses, resources depletion and pollution are among the most pressing concerns for the humanity

either at a national or global level (WWF, 2014). Climate change is one of the most significant challenges to the global economic development.

Every country contributes to growing GHG emissions, and bears its socioeconomic costs of global warming. In the Asian region, Southeast Asia is the most vulnerable to climate change. This includes countries like Myanmar, Cambodia, Brunei, Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand and Vietnam. Climate change is happening at its worst and if not addressed adequately, it could seriously hamper sustainable development and poverty eradication efforts in this region (Anbumozhi et al., 2012). The intergovernmental panel on climate change (IPCC) (IPCC, 2001; Stern, 2006) reported that the most important environmental problem of today is global warming. CO<sub>2</sub> is considered to be the primary GHG responsible for global warming, and its regulation has become an important intergovernmental issue. It is the objective of the 1997 Kyoto protocol to reduce GHG, the main cause of climate change. The Kyoto Protocol demanded the reduction of GHG emissions to 5.2% lower than the 1990 level during the period from 2008 to 2012 (Pao and Tsai, 2011). Total CO<sub>2</sub> emission of the ten Southeast Asia countries were reported at 1045.95 million tons (MT) in 2006, which was relatively low compared to the two giant CO<sub>2</sub> emission countries, namely China (6103.49 MT) and United States (5975.10 MT) (Lee et al., 2013). However, their CO<sub>2</sub> emissions should not be ignored because these countries recorded an increasing trend in CO<sub>2</sub> emissions throughout the years as illustrated by Table 1. It is expected that the emission rate will grow substantially in comparison to United States and China.

Hence, it needs actions and changes in policies related to the issue (Lee et al., 2013). Specifically, maintaining or reducing CO<sub>2</sub> emission along with sustainable development is a tough task for most of the Southeast Asia countries. Nonetheless, the

governments of these countries have shown their commitments, concerns and enthusiasm to reduce CO<sub>2</sub> emissions (Ghazali and Zahid, 2015). All the countries have signed and ratified the Kyoto Protocol, titled under non-Annex I parties (Yee et al., 2011).

Most of these countries associated themselves positively in weakly-bound Copenhagen Accord. Numerous conferences and promoting bodies have been formed under these countries and in the ASEAN, with the orientation to reaching a consensus in mitigating CO<sub>2</sub> emission and global warming effects (Lee et al., 2013). Evidently, the main approach to reduce the rise in global heating by no more than 2°C on 1990 levels is by reducing toxic emissions such as CO<sub>2</sub>. The world thus far has experienced 0.81°C rise in temperature and seen some devastating results on some areas of the world such as Northern Africa and a considerable impact on most other countries. In this respect, the governments are under severe pressure to lead in taking effective environmental actions (Dunphy, 2012).

Deployment of science is no doubt an important component in reducing climate change and its impacts. However, past studies have shown that focusing on science and technology alone does not guarantee successful climate change mitigation. Avoiding this tunnel-vision is vital. Implementation of strategies aimed at mitigation are largely contingent on the active cooperation of society (Blake, 1999). Hence, without proper and active engagement of the general public, solving the problem of climate change often posed challenge to scientists, politicians, engineers as well as government (Etim et al., 2012). Securing active cooperation and support from the general public requires a good deal of public awareness regarding environmental issues (Stern, 2006; Watkins, 2007). Past studies have shown that large majority of the people in developing countries have lower level of awareness about climate change in comparison to developed countries, despite being directly affected by climate change. Malaysia is no exception (Masud et al., 2013).

**Table 1: CO<sub>2</sub> emission per capita and CO<sub>2</sub> emission change (compared to 1990) in 2009**

Region	Country	CO <sub>2</sub> emissions (tons per capita)*		Variation (%)
		1990	2009	
South		1990	2009	
East Asia	Cambodia	0.05	0.33	560.0
	Brunei	25.47	23.69	-7.0
	Indonesia	0.81	1.90	134.6
	Laos	0.06	0.30	400.0
	Malaysia	3.11	7.10	128.3
	Myanmar	0.11	0.23	109.1
	Philippines	0.68	0.75	10.3
	Singapore	15.41	6.39	-58.5
	Thailand	1.68	3.95	135.1
	Vietnam	0.32	1.65	415.6
Europe	Germany	12.03	8.97	-25.4
	France	6.85	5.61	-18.1
	Netherlands	10.98	10.26	-6.6
	Spain	5.63	6.28	11.5
	Sweden	5.97	4.70	-21.3
	United Kingdom	9.96	7.68	-22.9
East Asia	Japan	8.86	8.63	-2.6

\*Denomination: U.S dollar. Source: Yee et al. (2011). CO<sub>2</sub>: Carbon dioxide

## 2. OBJECTIVES OF THE RESEARCH

The objective of the current study is to examine the level of public awareness regarding the CO<sub>2</sub> emissions, climate change, carbon capture and storage (CCS) in Malaysia. The empirical evidence will provide a basis for the formulation of strategic actions, pro-public and governmental decisions. The findings of this study also contribute to the extant literature in several ways. First, the study adds additional insight into the public awareness regarding climate change, CO<sub>2</sub> emissions, and CCS in the context of developing country. Most of the prior studies have focused on developed countries, while studies related to developing countries are still relatively limited. It has also been widely acknowledged that one cannot generalize the findings of studies on developed countries to the developing countries. Thus, this study provides empirical evidence on the level of awareness of CO<sub>2</sub> emissions (characteristics, importance, negative impacts and sources), climate change (importance and causes) and CCS (benefits, concerns regarding location and way forward) among the general public of Malaysia.

### 3. LITERATURE REVIEW

Studies have shown the direct relationships of knowledge, values, attitude and practices of the people towards a better quality environment (Oskamp and Schultz, 1996). It is important for the individuals to have the knowledge on what the environment is all about and the significance of it. The ways individuals relate to their environment are influenced by their knowledge and awareness of the importance to safeguard the environment (Ahmad et al., 2012). Awareness and understanding are two related terminologies. Awareness comes before understanding. The individuals may be aware of certain things, but they may not understand about what actually the information is all about. Therefore, understanding comes with the knowledge.

Public support is crucial to the success of mitigation the CO<sub>2</sub> emissions and adoption and implementation of CO<sub>2</sub> capture and storage (CCS). They need to be aware and understand that CCS can significantly reduce the level of CO<sub>2</sub> emissions released into the air. The emission was contributed by the combustion of fossil fuels. The International Energy Agency estimates that the cost of achieving desired climate stabilization by 2050 will be at least 70% higher if CCS is not available and widely deployed after 2020 (EU, 2011). This is supported by the literature that states public opinions, technical and economic considerations are equally pertinent in the process of development and deployment of CCS. In order to understand the public opinions and their concerns, it is necessary to recognize the factors that influence their perceptions about CCS (De Best-Waldhober et al., 2011). Unfortunately, earlier studies have shown that the public have mixed perceptions about CO<sub>2</sub> emissions and CCS. This was due to the low level of awareness and understanding (Wallquist et al., 2009). For instance, some associates CCS as nuclear waste while others believe CO<sub>2</sub> may cause lung cancer. CCS is a novel technology but large majority of the public are not aware and their knowledge about it is rather limited (de Best-Waldhober and Daamen, 2008). Consequently, their opinions are easily influenced by any new piece of information (De Best-Waldhober et al., 2011).

Several studies have been conducted in the past with mixed results regarding public perception and awareness of CO<sub>2</sub> emissions, CCS and climate change (Masud et al., 2013). For instance the authors urged that the importance of public knowledge and attitude is a central element for better natural livable environment (Patchen, 2006). Likewise, the public perception of climate change has a significant effect on future development and policies regarding the environment (Watkins, 2007). The public attitude towards their surroundings and environment is the manifestation of how they look at their surroundings and environment (Masud et al., 2013). Currently, numerous research initiatives have described that there is a gap between environmental awareness, and real presentation of pro-environmental behavior (Kollmuss and Agyeman, 2002). The results of some studies reported that awareness of CCS is very low in many countries (de Best-Waldhober and Daamen, 2008). Reiner and Curry (2006) compared the public awareness of CCS in the United States, the United Kingdom, Sweden and Japan. The study revealed low level of awareness in all four countries, ranging from 22% of respondents confirming they had heard or read something

about CCS in Japan, to as little as 4% respondents confirming this in the US. Another study in Japan supported the above findings with only 7-8% of respondents stated that they knew to some extent (Itaoka et al., 2009; Qureshi et al., 2015). Similarly, a study conducted in Canadian with 1972 respondents found low level of awareness. Although about 10% of the respondents in Alberta and Saskatchewan and 15% of respondents in the rest of Canada said to have heard of CCS, only very few of the respondents were able to correctly identify the CCS (Sharp, 2005). A survey conducted in Australia of 900 respondents found that only 29.9% of respondents were able to give meaningful answers when asked what they understood about CCS (Ashworth et al., 2009). A small study among 112 residents of the Dutch area found the same results of low level of knowledge of CO<sub>2</sub>. Of the 112 respondents, 97% stated that they knew either a little, very little or almost nothing about CO<sub>2</sub> storage (Huijts et al., 2007). De Best-Waldhober et al. (2011) highlighted the public concerns about the deployment CCS as it was a temporary solution, either because of storage capacity or because fossil fuels are finite. The respondents further expressed a general feeling that CCS was “dirty” or “polluting.” Shortage of appropriate information from trusted sources and shortcomings in education were among the factors influencing the outcome. In a study of public acceptance of CCS done in Germany, it was highlighted that perception of risks of CCS among the public is virtually non-existent, as the members of the public do not have any knowledge of CCS (Fischedick et al., 2009; Qureshi et al., 2016). Similar study done among the Chinese university students showed that respondents had relatively high level of awareness on CCS. The respondents perceived risks of CCS are higher than the accrued benefits. Nevertheless, they accepted the need of CCS development in China. The authors postulated that that, they raised their concerns on the implementation of the CCS projects nearby surrounding community (Xuan and Wangb, 2012).

Global warming, climate change, greenhouse effects, pollutions, deforestation are some of the environmental concerns confronting Malaysia (Alam et al., 2014). However, the importance of handling the environmental issues is not being accurately communicated to the public (Ahmad et al., 2012). In general, the findings from these studies showed low level of awareness of CCS, in particular. A study conducted by the WWF-Malaysia and Partners in the year 2007 found that 45% of adults and students understood the cause of environmental problems and climate change. Between 52.7% to about 65.3% admitted that they have placed some efforts towards environmental activities. Another study reported that the level of knowledge, attitude, skill and participation of Malaysian students towards environmental citizenship are very low and there is a compelling need for more environmental education in Malaysia (Meerah et al., 2010). Approximately 35% of the students have some knowledge on environmental citizenship, 20.3% have knowledge on fauna and biodiversity, 25% on international environmental treaties, and 20.2% of the students gathered environmental information from newspaper and television programs. Ahmad et al. (2012) conducted a study on Malaysian youth with regard to environmental citizenship, awareness of the environment and participation in green activities to save the earth. Six focus groups discussions were conducted within Klang Valley, with each group comprising of 5-6 people.

The informants consisted of Malay, Indian and Chinese youths between the ages of 18-25. The main focuses of the study were general and technical understanding of environmental issues, the sources of information on the environment and the role that these individuals and the community have played as environmental citizens. Masud et al. (2013) investigated the impact of awareness, knowledge and risk perception of climate change. They found significant influence on attitude and pro-environmental behavior. They indicate that the awareness, knowledge and risk perception of climate change positively influence the formation of favorable attitudes and future action towards climate change. In addition, the study also found a mediated relationship through attitudes between awareness, knowledge, risk perception and pro-environmental behavior. They concluded that “people are likely to accept pro-environmental behaviors only if they have sufficient understanding of the adverse impacts of no action.”

#### 4. RESEARCH METHODS

##### 4.1. Site Selection

For the purpose of exploring the public perceptions regarding CO<sub>2</sub> emissions, climate change and CCS, the study selected five states in Malaysia that include Perak, Melaka, Johor, Pahang and Terengganu. These states were chosen due to the high concentration of heavy industries in various industrial areas namely Manjung, Tangga Batu, Pasir Gudang, Gebeng, and Paka (Figure 1). The heavy industries include petrochemical plants, natural gas processing plants, electricity generating plants, and cement plants to name a few. These heavy industries used large volume of coal, natural gas and also electricity that resulted in large volume of CO<sub>2</sub> emission.

##### 4.2. Sampling Technique and Data Collection

The study employed convenience sampling method. In order the avoid biasness in opinion, the respondents involved in this study were from various background, education level and age (Masud et al., 2013). Self-administered questionnaire was used to obtain feedback from the public (Annexure 1). The questionnaire has two versions: Malay and English. The first section of questionnaire includes demographic information of respondents such as gender, age, education, and occupation. The second section was designed to examine respondents’ awareness and knowledge towards CO<sub>2</sub> emissions. The third section was about respondents’ awareness and knowledge towards climate change. The fourth section of the questionnaire related to respondents’ awareness and perceptions of CCS. The final section consists of respondents’ agreement or disagreement towards the implementation of CCS in the future. A total of 298 respondents participated in the survey.

#### 5. RESULTS AND DISCUSSIONS

Table 2 shows the demographic profile of the respondents.

In the Section B of questionnaire (Annexure 1) 73.8% of the respondents answered “Yes, and I know a bit about it (CO<sub>2</sub>)” while second in rank 11.2% responded that they have heard of it, but they don’t know anything about it. Both the percentages confirmed that

Figure 1: Location of study in Perak, Melaka, Johor, Pahang and Terengganu



Table 2: Demographics profile (Section A - Questionnaire)

Group	Number of respondents	Percentage
Gender		
Male	135	45.9
Female	159	54.1
Age		
20 or less	23	7.8
21-30	157	53.4
31-40	70	23.8
41-50	21	7.1
51 and above	23	7.8
Education		
Primary	7	2.4
Lower secondary	27	9.2
Upper secondary	68	23.1
Certificate diploma	101	34.4
Bachelor degree	79	26.9
Master degree and above	12	4.1
Income of respondents		
<1500	90	30.6
1501-3000	103	35.0
3001-4500	46	15.6
4501-6000	32	10.9
6001-7500	14	4.8
7501-9000	1	0.3
9001-10500	3	1.0
10501 and above	5	1.7

the respondents know about the CO<sub>2</sub> emissions, which is a very good sign for Malaysia that the general public is having awareness of CO<sub>2</sub> emissions. Furthermore, this is also confirmed by the mean value 4.5 of Question 2, and 3.49 of Question 3 in Section B that the highest mean shows that the respondents confirm that they correctly perceived CO<sub>2</sub> which is unhealthy. Question 4 reports satisfactory results with 4.22 mean value that the respondents understand the importance of CO<sub>2</sub> as it is necessary for the growth of plants and trees. In Question 5 the respondents were asked regarding the negative effects of CO<sub>2</sub>, and most of them responded that “CO<sub>2</sub> influences the climate” with highest mean value of 4.0. In conclusion all the results confirm that the awareness of CO<sub>2</sub> among the general public is very good in these five states.

In the first question of Section C the respondents were asked about the climate change and the study found good results. Closed to

81.0% respondents have answered “Yes, and I know a bit about it.” The respondents were aware of possible impacts of climate change as confirmed by the high mean values. They considered it as a reason for increased risk of droughts, fire and floods (mean value 4.32) and change in weather patterns (mean value 4.31). As a result, it proves that they are aware and have knowledge about climate change. In response to question regarding the causes of climate change the respondents selected “emissions from power stations/factories and industries (mean value = 4.32) and cutting down rainforest (mean value = 4.31).” In response to the last question of climate change section, they agreed that the earth is going warmer with a mean value of 4.27 and it also the result of CO<sub>2</sub> emissions from human actions with mean value of 4.12.

The first question of Section D revealed that the respondent’s knowledge regarding CCS is rather very low, and most of the respondents never heard of CCS as confirmed by 58.2% of the respondents. The second higher response was that 27.6% of respondents have heard of it (CCS) but they don’t know anything about it. Most of the respondents answered “never to hear about it” when asked about the awareness on the implementation of CCS projects in Malaysia. This is reflected by the mean value of 1.36 with highest percentage of 73.8%. Among the respondents who knew about CCS, 16% claimed that they were informed through printing media and 8.5% through social media, whilst the others heard about CCS via other sources such as from friend and family members. As discussed earlier, most of the respondents were unaware of the CCS and needed to be briefed about it. In view of this, a brief introduction was given to the respondents on the data collection spot and then they were requested to give their opinion on the benefits of the CCS implementation. The respondents agreed that CCS is good as it will create more jobs, mitigate climate change by decreasing the average global temperature as mentioned in Section D of questionnaire (Question 4).

Following this, Questions 5 and 6 were designed to assess the public concerns about CCS storage locations. The respondents replied that they have deep concerns regarding CCS storage locations as illustrated by 2.38 mean value. Among others they were concerned about the safety of transportation of CO<sub>2</sub> to the storage site, risk of leakages while the site is in operation, risk of building damage and ground motion due to increase of underground pressure during CO<sub>2</sub> injection, the possible risk of sabotage to the site, possible deterioration in local property market. Having said that, they viewed CCS technology will be able to mitigate climate change (mean value 3.7). The capture technology will reduce the CO<sub>2</sub> emissions to the atmosphere (mean value 3.82). The respondents felt that CO<sub>2</sub> storage will be necessary to mitigate the rise in average temperature on earth (mean value 3.7). On the contrary, the respondents showed mixed feelings about the possibility of reduction in electricity cost with the installation of CO<sub>2</sub> capture technology in power generation, CO<sub>2</sub> storage in the neighborhood will cause hardly any inconvenience, the safety of CO<sub>2</sub> storage for the surroundings will never be sufficiently guaranteed, and CO<sub>2</sub> storage will carry too many risks for public health.

A number of valuable inputs were gathered from the respondents pertaining to the way forward for CCS adoption and implementation.

Generally, the respondents agreed that CCS will result in the improvement of the environmental sustainability for future generation (mean value 3.82). However, they strongly suggested that public opinions must be taken into serious consideration in decision making process that related to CCS implementation (mean value 3.95). Welfare of public must not be neglected if CCS is to be implemented (mean value 3.77). They also have the opinion that sufficient financial support (in terms of incentives and subsidy) from the government is required so that the implementation of CCS will not give any consequential increase in the electricity bill (mean value 3.87).

## 6. CONCLUSION

The findings of the study indicate that generally the Malaysian public is aware of the negative impacts of CO<sub>2</sub> emissions and climate change. However, their knowledge about CCS is rather low. Evidently, they have heard of CO<sub>2</sub> emissions and climate change but are not aware of CCS. Hence, the efforts to increase the public awareness and knowledge on CO<sub>2</sub> emissions, climate change, and CCS are essential. The awareness of such issues among the public is considered as a first step. Consequently, people with high levels of awareness are willing to behave more environmental friendly to lessen the impact of climate change. Hence, it is important to educate and aware the general public using all media channels. This study is useful to formulate strategic decisions towards CO<sub>2</sub> emissions, climate change and CCS technology adoption and projects implementation in Malaysia. It is highly recommended to examine mitigation strategies to increase the level of the general public awareness with respect to climate change and CCS implementation in particular.

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## ANNEXURE 1 QUESTIONNAIRE

Section B	Frequency (%)
1. Have you ever heard of CO <sub>2</sub>	
No, I have never heard of it	22 (7.5)
I have heard of it, but I don't know anything about it	33 (11.2)
Yes, and I know a bit about it	217 (73.8)
Yes, and I know a lot about it	22 (7.5)
Section B	Mean±SD
2. What do you think CO <sub>2</sub> is? CO <sub>2</sub> is perceived to be the following: (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
Carbon monoxide	2.48±1.40
CO <sub>2</sub>	4.45±0.90
GHG	3.36±1.33
A gas	3.84±1.23
A chemical	3.06±1.40
Water	2.43±1.45
Carbon	3.61±1.30
Ozone	2.97±1.38
Methane	2.46±1.24
3. Following statements are about possible characteristics of CO <sub>2</sub> Please indicate for each to what extent you are convinced the statement is true or false (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
It is flammable	2.53±1.47
It is unhealthy	3.48±1.38
It is harmful	3.14±1.39
It is explosive	2.47±1.30
It is invisible	4.09±1.30
It is odorless	3.62±1.44
4. The following statements are about importance of CO <sub>2</sub> Please indicate for each to what extent you are convinced the statement is true or false (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
CO <sub>2</sub> is necessary for the growth of plants and trees	4.22±1.21
CO <sub>2</sub> makes a habitable climate on earth possible	3.67±1.45
CO <sub>2</sub> can be used in the formation of dry ice for refrigerating purposes	3.42±1.15
CO <sub>2</sub> can be used for fire extinguishing purposes	3.73±1.22
CO <sub>2</sub> can be used as an ingredient for urea production	3.12±1.08
CO <sub>2</sub> can be used for enhanced oil recovery in oil and gas industry	3.31±1.10
5. The following statements are about possible negative effects of CO <sub>2</sub> Please indicate for each to what extent you are convinced the statement is true or false (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
CO <sub>2</sub> causes acid rain	3.61±1.26
CO <sub>2</sub> causes cancer	2.96±1.31
CO <sub>2</sub> influences the climate	4.00±1.08
CO <sub>2</sub> causes haze	3.54±1.28
CO <sub>2</sub> erodes the ozone layer	3.60±1.30
CO <sub>2</sub> is harmful if in contact with skin	2.96±1.33
6. Following statements are about possible sources of CO <sub>2</sub> , which can be true or untrue Please indicate for each to what extent you are convinced the statement is true or untrue (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
CO <sub>2</sub> is released when you exhale	4.34±1.05
CO <sub>2</sub> is released when wood is burned	3.88±1.20
CO <sub>2</sub> is released from the exhaust pipe of vehicles	3.63±1.38
CO <sub>2</sub> is released during waste disposal	3.49±1.24
CO <sub>2</sub> is released when plants and trees decompose	3.19±1.30
CO <sub>2</sub> is released during energy production from natural gas	3.67±1.10
CO <sub>2</sub> is released during energy production from coal	3.54±1.16
CO <sub>2</sub> is released during energy production from oil	3.45±1.15
Section C	Frequency (%)
1. Have you ever heard of climate change?	
No, I have never heard of it	3 (1.0)
I have heard of it, but I don't know anything about it	37 (12.6)
Yes, and I know a bit about it	238 (81.0)
Yes, and I know a lot about it	16 (5.40)

Section C	Mean±SD
2. The following statements are about possible impacts of climate change Please indicate for each to what extent you are convinced the statement is true or false (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
Changes in weather patterns	4.31±0.87
Changing landscapes	3.73±1.18
Increased risk of drought, fire and floods	4.32±0.90
Reduce food supply due to drought and flooding	3.95±1.19
Wildlife at risk	4.09±1.10
More heat related illness (ex: Heat stroke) and disease	4.17±1.00
Economic losses	3.85±1.17
3. The following statements are about possible causes of climate change Please indicate for each to what extent you are convinced the statement is true or false (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	
Natural activity such as volcanic activity	3.34±1.35
Burning fossil fuels for energy	4.07±1.03
Cutting down rainforest	4.31±0.93
Emissions from cars/road transportation	4.23±0.98
Emissions from power stations/factories and industries	4.32±0.94
Pollution from others countries	3.92±1.08
Burning fossil fuels	4.18±1.00
4. Please indicate for each to what extent you are convinced the statement (1=Not very confident, 5=Very confident)	
To what extent are you convinced the climate on earth will become warmer on average	4.27±0.86
To what extent are you convinced global warming is a result of CO <sub>2</sub> emissions by human actions	4.12±1.01
To what extent are you convinced global warming is being exaggerated	3.57±1.15
To what extent are you convinced global warming can be stopped	3.19±1.20
Section D	Frequency (%)
1. Have you ever heard of CCS	
No, I have never heard of it	171 (58.2)
I have heard of it, but I don't know anything about it	81 (27.6)
Yes, and I know a bit about it	42 (14.2)
Yes, and I know a lot about it	00 (00)
2. Have you heard of plans to implement CCS Malaysia?	1.36 (0.65)
No, I have never heard of it	217 (73.8)
I have heard of it, but I don't know anything about it	50 (17)
Yes, and I know a bit about it	26 (8.8)
Yes, and I know a lot about it	1 (0.3)
3. From which source/sources did you hear about the plans?	
Printed media (newspaper, magazine, flyers, billboards, brochures, etc.)	47 (16.0)
Non-printed media (Television, Radio, On-line news etc.)	15 (5.1)
Social media (Facebook, Twitter, YouTube, Instagram, WhatsApp, etc.)	25 (8.5)
Friends and family	12 (4.1)
Other, Please specify	6 (2.0)
Total (only 35.7% of the respondents heard of CCS)	105 (35.7)
4. Following statements are about possible benefits of CO <sub>2</sub> capture and storage implementation, which can be true or false. Please indicate for each to what extent you are convinced the statement is true or false (1=I'm sure it would not, 5=I'm sure it would)	
It would create jobs	3.59 (1.12)
Exposure to new technology like CCS would able to increase awareness towards climate change issues	3.89 (0.97)
Development of infrastructure which will provide advantage to the neighborhood	3.64 (1.00)
Increase business opportunity within the compound	3.34 (1.07)
The price of electricity would be lower	3.00 (1.10)
CO <sub>2</sub> storage will generate profits for companies that will employ it	3.51 (0.91)
It would reduce the water pollution in your local area	3.46 (1.06)
It would improve the quality of the air	3.91 (1.02)
Mitigate climate change	3.91 (0.97)
It would decrease the average global temperature	3.89 (0.95)
Breathing difficulties can be prevented among children and senior citizen	3.81 (1.07)
Extreme precipitation and flooding can be prevented	3.45 (1.04)
5. If a deep underground storage site for CO <sub>2</sub> were to be located within 5km from your home, how concern would you be? (1=Overly concern, 2=Fairly concern, 3=Concern, 4=Less concern, 5=Not concern at all)	2.38 (1.00)
6. What are the reasons of your concern? (1=I'm sure it is not, 2=It's not, 3=Fairly it's/neither it's not or it's, 4=Its, 5=I'm sure it is)	



The transport of CO <sub>2</sub> to the storage site might not be safe	3.71 (1.00)
The risk to environment and health in case of leaks while the site is in operation	3.95 (0.97)
The risk of building damage and ground motion due to increase of underground pressure during CO <sub>2</sub> injection	3.71 (1.01)
The risk of sabotage to the site	3.49 (1.07)
A possible deterioration in local property market	3.55 (1.09)
7. Following are statements about CO <sub>2</sub> capture and storage (CCS), which can be true or false (1=I'm sure it will not, 5=I'm sure it will)	
CCS is viewed as technology that will be able to mitigate climate change	3.70 (0.89)
CO <sub>2</sub> capture will reduce the CO <sub>2</sub> emissions to the atmosphere	3.82 (0.89)
CO <sub>2</sub> capture will be installed in electricity generation in attempt to reduce electricity cost	3.28 (1.05)
CO <sub>2</sub> storage will be necessary to mitigate the rise in average temperature on earth	3.70 (0.96)
CO <sub>2</sub> storage in the neighborhood will cause hardly any inconvenience.	3.06 (1.10)
The safety of CO <sub>2</sub> storage for the surroundings will never be sufficiently guaranteed	3.29 (1.04)
CO <sub>2</sub> storage will carry too many risks for public health	3.25 (1.02)

<b>Section E</b>	<b>Frequency (%)</b>
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1. Following are statements about possible way forward on CCS implementation (1=Disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=I strongly agree)	
It will improve the environmental sustainability for future generation	3.82 (0.94)
Consider public opinions into decision making process that related to CCS implementation	3.95 (0.91)
Welfare of public does not neglected if CCS is to be implemented	3.77 (0.97)
Sufficient of financial support (in terms of incentives and subsidy) from government so that the implementation of CCS will not impact on the increment of the electricity bill	3.87 (1.01)

SPSS version 22.0 was used for data analysis. CO<sub>2</sub>: Carbon dioxide, GHG: Greenhouse gases