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# The Awareness and Impact of Carbon Capture and Storage (CCS) on Climate Change in Malaysia

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## ABSTRACT

This article aims to investigate the level of public awareness and perception regarding carbon capture and storage (CCS) and climate change in Malaysia. The article also aims to identify those social, economic and environmental issues which affect CCS and combating climate change in the country. The findings revealed that more than 79 percent of the respondents were willing to have government initiatives to implement CCS projects. However, about 21 percent were against these initiatives due to their different perceptions and opinions regarding CCS. By using partial least squares (PLS) model through SmartPLS 2.0, it is found that social and economic issues of CCS have significant positive while environmental issues have no significant impact on combating climate change. The findings offer significant implications for regulators, policy makers, and practitioners regarding social, economic and environmental issues of CCS and climate change in Malaysia.

## KEYWORDS

Carbon Capture and Storage (CCS), Climate Change, Malaysia, Public Awareness

## INTRODUCTION

Modernization changed the face of the earth inevitably. Natural resources depletion, biodiversity loss, a decline of an ecosystem, and intensifying pollution are arising problems of the twenty-first century and has an impact on human civilization (Lubchenco, 1998). The emissions of greenhouse gasses (GHG) are considered as the main source of these environmental changes. The Intergovernmental Panel on Climate Change (IPCC) reports that the most severe environmental problem of today is global warming due to GHG. And carbon dioxide ($CO_2$) considered as a primary source of GHG responsible for this global warming. To control the severity of GHG and $CO_2$ emissions, many regulatory bodies have step forwarded like Kyoto Protocol 1997, etc. Somehow, these efforts achieved good results but not that far and it is generally concluded that deployment of these efforts is not fully fruitful. Therefore, CO2 emissions are still showing the upward trends. Generally, it is further reported that these efforts are not alone enough and does not guarantee the mitigation of GHG and $CO_2$ emissions. Now the world has shifted to capture $CO_2$ and by making its use, efficient and thus

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reduce its negative impacts. Hence, it has emerged a new technology named $CO_2$ capture, and storage (CCS). CCS can be defined as:

*Carbon capture and storage (CCS) is the process of capturing carbon dioxide ($CO_2$) emissions from large point sources (such as power stations and industrial facilities) and transporting the gasses in pipelines to very deep subsurface rock formations, where it can be safely and permanently stored. CCS prevents the release of large quantities of $CO_2$ into the atmosphere, which is causing climate change. (TUC & CCSA, 2014)*

CCS is a technology that attracts the attention of many stakeholders and has the potential to mitigate the negative impact of CO2 emissions. However, the concept is very new and having some miss perceptions among the general public such as on a risk of its leakage on its storage and injection sites (Itaoka, Okuda, Saito, & Akai, 2009). The authors further concluded that this miss perception is due to the low level of awareness of the understanding of CCS, which consider as among the challenging factors of CCS implementation. In the current study, we are intended to explore the level of public awareness of different aspects of CCS including social, environmental and economic issues. Moreover, the current study also investigates the impact of these issues on the climate change in Malaysia.

In Malaysia, there are approximately 83 percent trillion cubic feet of proven natural gas reserves containing 28 to 87 percent of the $CO_2$ level. Over 13 trillion cubic feet of the natural gas reserves remained unexplored due to the availability of $CO_2$ contents (Darman & Harun, 2006). However, due to increase in energy demands worldwide had demanded Malaysia to increase its natural gas productions substantially.

Unfortunately, limited natural gas reservoirs with low $CO_2$ content results in an increasing exploitation of natural gas fields with high CO2 content. By utilizing these fields there is the possibility of more $CO_2$ release in the atmosphere which in turn to increase global warming and climate change of Malaysia. And thus, the government of Malaysia (GOM) may face some potential penalties and restrictions from the regulatory bodies. Moreover, for the urgent and optimum utilization of these gas fields the GOM required developing technologies for the effective carbon capture, storage, and subsequent utilization. However, there are a number of challenges to resolve the issues around the CCS chain. The recognition of a diverse group of stakeholders is one among the most challenging issues to in place the CCS operations. These include sensitivity towards the social, economic, and environmental issues of CCS implementations. In most of the past studies, the authors report that public perceptions, social issues, and economic concerns to name a few are the challenges for the implementation of CCS (Yee, Devi, Wong, & Khin, 2011). Moreover, in CCS implementation programs, each of the stakeholder groups has ultimately critical in determining the viability of the initiatives. Different stakeholders may have their different stakes which may refer to their role and responsibility on the issue. Therefore, there is a need to address the key stakeholder issues and concerns related to social, economic, and environmental issues prior to the implementation of CCS project.

Nonetheless, research on the awareness of CCS and climate change is limited (Ghazali, Zahid, Kee, & Ibrahim, 2016). Moreover, there is no research in Malaysian context that focused on the awareness of climate change, social, environmental and economic issues of CCS. Hence, the current study is conducted to find the level of climate change, social, environmental and economic issues on CCS. Moreover, the study also investigates the impact of social, environmental and economic of CCS on climate change. Therefore, the current study has the following objectives:

- To identify the level of carbon capture and storage among Malaysians;
- To identify the difference of awareness on CCS, climate change, social, environmental and economic issues between male and female;