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Valuing climate protection by offsetting carbon emissions: rethinking environmental governance

Muhammad Mehedi Masud [a, *], Abul Quasem Al-Amin [b], Rulia Akhtar [c], Fatimah Kari [a], Rafia Afroz [c], Md Saifur Rahman [a], Mahfuzur Rahman [d]

[a] Faculty of Economics and Administration, University of Malaya, 50603 Kuala Lumpur, Malaysia
[b] International Business School (IBS), Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia
[c] Faculty of Economics and Management Sciences, International Islamic University, Malaysia
[d] Faculty of Business and Accountancy, University of Malaya, 50603 Kuala Lumpur, Malaysia

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ABSTRACT

This study aimed to investigate households' willingness to pay (WTP) for a carbon reduction programme, the demographic and socioeconomic factors that influence households' WTP. The contingent valuation method (CVM) was employed as a mechanism to decide a monetary valuation of public preferences for offsetting carbon emissions by ascertaining the value attached to climate protection in Kuala-Lumpur, Malaysia. The valuation of public preference was measured by the households' WTP for a specific amount of climate protection. This study found that approximately 71% of households were WTP towards the protection of the climate (better environment). The findings validated that socioeconomic variables, such as education, income, acquired awareness and knowledge of climate change issues have significant impacts on WTP and the mean WTP is MYR15.38 (US$1 = MYR3.25) monthly. However, WTP varied considerably with household perception of the value of climate protection. This study would be useful in designing an appropriate policy framework fostering new policy-oriented sustainability and further carbon footprint research.

1. Introduction

Environmental concern is among the leading issues that have attracted global attention in recent times (Masud et al., 2013). The global attention resulting from the growing extent of many environmental impacts has brought together scientists and policy makers to search for a sustainable solution. Consequently, the notion of awareness and understanding in striving for a sustainable solution by direct mitigation or an alternative strategy has been a focus of research since increased industrialization (Masud et al., 2013). Scientific literature suggests that human beings are central to finding a way forward, engaging in debates concerning potential solutions, as they are directly and indirectly part of the environmental problems according to the Intergovernmental Panel on Climate Change (IPCC, 2007). Ironically, environmental problems have created by activities designed to improve human lives. Unfortunately, what possible and effective applicable solutions to further environmental impacts may be remains an unanswered question for scientists.

However, within the dispute and disagreement for a defensible solution several methods proposed by many researchers (Leiserowitz, 2007; Schmidt, 2007), one is to motivate individuals to modify their lifestyles to consume less energy. To meet this objective, an individual should estimate how much energy he/she consumes (Masud et al., 2013). Unfortunately, this kind of research is lacking in the developing countries. Moreover, developed countries saw a reduction in their levels of CO_2 emissions between 2006 and 2010, while developing countries demonstrated increased emissions. Malaysia is one of them and following increasing trends in emissions (Mustapa et al., 2010).[1] Conversely, the Stern report (2006) made Malaysia aware of the future environmental impacts of emissions. However, an effective and maintainable emission reduction route is not an easy task when Malaysia simultaneously

* Corresponding author. Tel.: +60 132340837; fax: +60 3 7956 7252.
E-mail address: mehedi_rajapur@yahoo.com (M. Mehedi Masud).

[1] In 2006, China replaced the US as the highest global CO_2 emitter. Since 2006, China's CO_2 emissions have increased by 28% or 1.8 billion metric tonnes per year (Petroleum, 2011).

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undertaking economic development by industrialization and fossil fuel utilization.

Malaysia is a rapidly developing country with a vision of attaining developed country status by 2020. However, to become a developed nation by its target date, the rapid growth necessary may present severe consequences with regard to the climate change burden. Malaysia is already facing the adverse effects of the climate change burden in relation to its biodiversity and forestry, coastal and marine resources; hence, its macro-economic target is threatened (Masud et al., 2013). It is progressively struggling to attain its climate change and development visions and targets and facing considerable challenges along the way in handling economic, population and energy growth demands and plans to reduce GHG (greenhouse gas) emissions. Emissions from the energy sector alone are 190 million tonnes per capita (Mustapa et al., 2010).[1] According to the national energy statistics, Malaysia's GHG emissions are steadily increasing.[2] Per capita emissions increased "from 4.21 tonnes in 1994 to 6.29 tonnes in 2001" (Begum et al., 2010). Recent studies indicate that Malaysia's CO_2 emissions were 279 million tonnes per capita in 2007. Fig. 1 summarizes the sectorial carbon emissions from the energy sector. Recently, Malaysian government has declared its intention to reduce GHG discharges by 40% compared to 2005 emission levels by year 2020. The statistics from national reports (Peng et al., 2004; UNDP, 2007) make a good case for the urgent need to take active steps to reduce carbon emissions in order to meet the Malaysian target for 2020.

Achieving GHG emissions targets and becoming a developed country by 2020 will by no means be easy because of feeble organizational capability, partial commitment in environmental issues and an absence of confirmation of indigenous understanding on climate change issues (Adams et al., 1988; SPORE, 2008). Finding a framework to provide solutions and facilitate understanding of an alternative strategy, together with engineering mitigation, is undoubtedly important in the global arena to reduce the environmental effects and impact; behavioural change and promoting adaptive willingness are among the best alternatives to mitigate long-term vulnerability.

Therefore, it is essential to analyse the socioeconomic factors as an alternative way which influence an individual's WTP for reductions in carbon emissions with a view to combating the environmental impacts and to define the value of non-market goods, thus determining a monetary valuation of public preferences. The WTP for carbon reduction programmes and identifying factors that influence households' WTP for environmental protection programmes is still under-researched in many developing countries, Malaysia in particular. As yet, no such study has been undertaken to evaluate WTP for climate protection programmes using CVM in Malaysia. WTP may assist to develop a suitable alternative framework for combating the adverse effects of environmental change, reducing the carbon footprint. Establishing an individual's WTP for carbon emission reduction would help decision makers to take alternative steps that would increase individual engagement in lessening environmental impact.

[2] According to a United Nations Development Report, Malaysia with its population of 27 million is ranked "as the 26th largest greenhouse gas emitter in the world" (UNDP, 2007).The increase in emissions is due to certain main sources, namely urbanization, changes in land use, increased energy demands (i.e. from the power industries and transport sectors), increased usage of land transport and continuing reliance on fossil fuels. With its rapid industrialization, Malaysia is becoming increasingly dependent on conventional energy sources. Over the years, the growing use of energy, which has largely depended on fossil fuels, has increased GHG emissions.

In order to develop a clear picture and sound understanding of WTP for a carbon reduction programme and to define the demographic and socioeconomic factors that influence households' WTP, study tested several hypotheses. In particular, this study aimed to determine WTP for climate protection programmes as no such study has yet been undertaken in Malaysia. Thus, the following hypotheses proposed:

H1. Socioeconomic factors have a positive direct relation on willingness to pay (WTP) for carbon reduction programmes.

H2. A household's knowledge of and concern for environmental issues has a positive and significant relation with WTP for carbon reduction programmes.

H3. A favourable attitude towards environmental quality has a positive relation with WTP for carbon reduction programmes.

2. Methodology

2.1. Study area

There are three territories in Malaysia such as Kuala-Lumpur,Putrajaya and Labuan that is governed directly by the federal government of Malaysia. Kuala Lumpur is the national capital of Malaysia. However, this study focused on the federal territory of Kuala-Lumpur for several reasons, one of which is that it has the largest population and economy in terms of GDP in Malaysia (DOSM, 2012). It also considered as Malaysia's transportation and industrial hub which contributed to the state's rapid development (DOSM, 2012). The federal territory of Kuala-Lumpur consists of 11 cities, as shown in Fig. 2.

2.2. Sampling technique and size

The survey was conducted from September to December in 2012. All of the respondents were Malaysian citizens. Our target respondent was the head of the household. The questionnaires were distributed and collected through face-to-face interviews. Using a cluster sampling technique, we clustered the study area into 11 cities based on geographic location; we then randomly chose the respondents in the sample from the study area. In order to obtain appropriate sample size from this population, the following formula was used (Lind et al., 2012):

$$n = \pi(1-\pi)(Z/E)^2$$

where, n is the size of the sample, π (0.50) is the population proportion, Z is the standard normal value corresponding to the desired level of confidence, E is the maximum allowable error.

Based on the formula for sample size, $Z = 1.96$ (95% confidence level), $\pi = 0.5$, and $E = 5\%$. The study area consists of a population of 1.67 million with 434,116 households. For each cluster, 38 questionnaires were distributed using quota sampling. Thus, we calculated a sample size of 384.16; as this was not a whole number, we rounded up to the next whole number, i.e. 385. A total of 420 questionnaires were distributed among households through face-to-face meetings. Leedy and Ormrod (2005) consider that a sample size of 400 is adequate if the target population size is above 5000. The response rate was 90%. Of the 420 questionnaires, only 35 questionnaires were unacceptable, resulting in 385 usable questionnaires. All the respondents were over 18 years old. Prior to final data collection, a pilot test was conducted on 30 households to investigate the households' understanding, the clarity of the questions and to avoid any misunderstanding in the questions.