Energy Policy 61 (2013) 1055–1062

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Predictors of technical adoption and behavioural change to transport energy-saving measures in response to climate change

M.S. Aini *, S.C. Chan, O. Syuhaily

Sustainable Consumption Studies Research Centre, Faculty of Human Ecology, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

HIGHLIGHTS

- A survey was conducted to examine acceptability of transport energy-saving measures.
- Gender, knowledge of causes, efficacy and personal norm are predictors of technical measures.
- Personal norm and perceived efficacy influenced acceptability of behavioural change.
- Both measures are strongly correlated to psychological factors than to socio-demographic variables.

ARTICLE INFO

Article history:
Received 20 October 2011
Accepted 4 June 2013
Available online 11 July 2013

Keywords:
Transport
Climate change
Energy

ABSTRACT

Energy conservation can be achieved through the adoption of technical measures or the changing of one's behaviour. A survey of 201 Malaysian public personnel was conducted to examine the predictors of these two types of transport energy-saving measures in response to climate change. The results indicated that there were significant differences in the relative acceptability of both behavioural measures with respect to gender, level of education, income, knowledge of climate change and attitude. Gender, knowledge of causes of climate change and personal norm were predictors for the acceptability of technical measures, while perceived efficacy and personal norm were the factors that influenced the acceptability of behavioural measures. The results also indicated that distinctions ought to be made between technology adoption and behaviour modifications that require lifestyle changes when assessing pro-environmental intent behaviour. The implications for theory and practice are discussed.

1. Introduction

Transportation is one of the major human activities that presently relies almost entirely on petroleum oil, a type of fossil fuel that cannot be renewed and regenerated. Fossil fuels, such as oil, coal and gas, provide 82% of the world's energy requirement and have been identified as the largest single contributor to increase carbon dioxide (CO_2) (IPCC, 2007). Furthermore, CO_2 has been identified as one of the main greenhouse gases (GHGs) causing global warming. Among the modes of transport, road transport is the largest user of energy in all countries (IEA, 2009), including Malaysia, where it accounts for almost 31% of the CO_2 emissions (Azman et al., 2006).

Malaysia is the 26th largest source of GHG emission in the world, a position that places it within the ranks of industrialised nations (United Nation Statistics Division, 2010). The CO_2 emissions of Malaysia are relatively high compared to the world average and other Southeast Asian countries. The challenge is how to cater to the rising demand of transportation needs, while, at the same time, reducing the impact of transport on the environment.

2. Research Objectives

The present study aims to examine whether the acceptability of specific transport energy-saving measures is related to different antecedents, with specific focus on socio-demographic variables, knowledge and psychological factors. Acceptability in this study refers to the behavioural intention of one's willingness to undertake transport energy-saving measures in the future. The theory of planned behaviour (TPB) (Ajzen, 1991) and the Norm-Activation Model (NAM) by Schwartz (1977) constitute the theoretical bases of the current study. The TPB assumes that the intention to perform a behavioural option is directly influenced by the attitude towards behaviour, subjective norm and perceived behavioural control/perceived efficacy. The NAM, however, proposes that personal norms, which are defined as the self-expectations that

* Corresponding author. Tel.: +0060389467095; fax: +0060389436157.
E-mail addresses: ainims@putra.upm.edu.my, ainims@upm.edu.my, ainimatsaid@yahoo.com (M.S. Aini).

0301-4215/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.enpol.2013.06.002

are based on internal values (Schwartz, 1997), would impel individuals to engage in a certain behaviour as reflected by those self-held values. The present study explores the influence of the personal norm of the NAM, attitude and perceived efficacy of the TPB and knowledge in predicting acceptability of adopting transport energy-saving measures. The rationale for selecting and combining these variables is discussed in the literature review section. A distinction is made between acceptability of adopting specific technological devices for transport energy saving (e.g., speed limiter) and acceptability of transport behavioural change measures (e.g., carpooling).

3. Literature Review

3.1. Energy-Saving Strategies

Whilst legislation seeks to promote the use of energy efficiency products, the rate at which they are being adopted does not have a significant enough impact on the reduction of carbon emissions to meet the current targets through the Kyoto protocols (Faiers et al., 2007). Indeed, some people show concern and engage in actions to counter climatic change while many individuals are not perturbed by the negative consequences of global warming. As such, a lot of research in recent years has been undertaken to identify factors that motivate pro-environmental behaviour, in general (Patchen, 2006), and the adoption of energy-saving behaviour, in particular (O'Connor et al., 1999; Bord et al., 2000; Poortinga et al., 2004).

Studies on strategies aiming to change travel behaviour, which is referred to as travel demand management measures (TDMs) (Eriksson et al., 2006), have used the terminology 'acceptability' interchangeably with other phrases, such as 'support', 'in favour of', 'a good idea', 'agree' and 'should be introduced' (Jaensirisak et al., 2005). As a concept, the acceptability of environmental policies can be defined either in terms of an attitudinal measure or as a specific type of pro-environmental behaviour (Schuitema and Jakobsson Berstad, 2012). The attitudinal measure refers to the positive or negative judgement of those TDM policies, while the behavioural approach gauges one's intention to adopt specific measures that might be introduced/initiated in the future. The present study adopts the latter definition of acceptability. Addressing the important factors influencing the acceptability of various measures is crucial as the effectiveness of any strategy for behaviour change depends on it (Sikow-Magny, 2003). Public acceptability is also one important precondition for the successful implementation of any TDM measure (Schade and Schlag, 2003). Numerous studies have been conducted to examine the factors that influence the acceptability of TDM measures, such as socio-demographic/economic factors (Reinstra et al., 1999), psychological factors (Schade and Schlag, 2003; Eriksson et al., 2006), price (Schade and Schlag, 2003; Jaensirisak et al., 2005) and infrastructure (Schade, 2003).

Changing the energy consumption behaviour of consumers is one of the mitigation strategies that can be adopted to alleviate the problem of climate change (Semenza et al., 2008). In general, the energy-saving strategy comprises two components, namely, technical and behavioural measures (Poortinga et al., 2003). Technical measures aim to reduce the energy demand from the transport sector by increasing the energy efficiency of the vehicles, for example, encouraging people to buy and use more fuel-efficient vehicles or implementing a stricter vehicle fuel economy standard (Wagner et al., 2006). By contrast, the behavioural measures that aim to reduce the transport demand include shifting to less polluting transport modes, changing destination choices, carpooling or travelling less (Steg and Gifford, 2005).

Technical measures are a one-shot behaviour that involves the purchase of energy-efficient appliances or devices. They often require initial investment, which might inhibit their adoption, particularly if there is no inducement through regulations or incentives. High-energy-efficiency products, such as hybrid electric vehicles, although cost-effective in the long term (save fuel), and, at the same time, reduce CO_2 emissions, are rather costly (Turrentine et al., 2006). On the other hand, behavioural measures involve repetitive efforts to reduce energy use, which are often associated with a decreased level of comfort or required lifestyle changes (Gardner and Stern, 2002).

Abrahamse et al. (2005) cautioned that the usage of energy-efficient appliances does not necessarily result in an overall reduction of energy consumption when their usage frequency increases. This lost part of energy conservation is denoted as the rebound effect (Berkhout et al., 2000). As such, in order to meet the long-term target reduction in the consumption of fossil fuels, technological advancement is not the sole solution to the problem. Therefore, technological adoption measures must be accompanied by behavioural changes in order to reduce GHG emissions from the transport sector in the long term (Chapman, 2007).

3.2. TPB and NAM

The TPB by Ajzen (1991) is one of the most established and influential theories of social behaviour and is used to explain all kinds of behaviour including environmental behaviour (Bamberg and Schmidt, 2003). The TPB posits that attitude, perceived behavioural control and subjective norm influence behavioural intention. The attitudinal variable within the TPB refers to the degree that a person has a favourable or an unfavourable evaluation of an ecological behaviour (e.g., recycling) (Ajzen, 1991). A positive attitude to a specific environmental concern (climate change) was found to be associated with behavioural intention (energy saving in response to climate change) (Poortiga et al., 2004). However, a study by Berenguer et al. (2005) who used the general environmental concern scale failed to predict pro-environmental intention. On this note, the present study explores the specific attitude towards energy conservation rather than the general attitude to the environment as a possible factor that may influence the acceptance of transport energy-saving measures.

In TPB, perceived behavioural control refers to the belief about how feasible it is to perform a particular behaviour. It reflects the perceptions of feasibility by the subject concerning how difficult (or easy) it will be to undertake the new behaviour, representing the factor of self-efficacy (Stradling, 2004). Abrahamse and Steg (2009) found that perceived behavioural control, in particular, appears to be the key factor in households' intention to reduce energy use and their actual energy savings. Similarly, a study by Wall et al. (2007) showed that perceived behavioural control has the strongest significant influence on the intention to reduce car use for commuting. This is further supported by Bamberg et al. (2007) concerning the intention to use public transportation in the Frankfurt subsample and Hunecke et al. (2007) on the use of private motorised vehicles. Based on the findings of these studies, we predict that behavioural control (perceived efficacy) is one of the determinants of acceptance of transport energy-saving measures. The third variable in the TBP that is hypothesised to influence behavioural intention is the social/subjective norm. This refers to the perception of whether one's action is influenced by the expectations of significant reference persons, such as friends, family and society, to perform the recommended behaviour. However, this variable is excluded from the study as previous meta-analysis studies reported that the social norm exerts no direct effect on behavioural intention (Armitage and Conner, 2001; Bamberg and Moser, 2007).