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Application of theory-based evaluation for the critical analysis of national biofuel policy: A case study in Malaysia

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ABSTRACT

Theory-based evaluation (TBE) is an effectiveness assessment technique that critically analyses the theory underlying an intervention. Whilst its use has been widely reported in the area of social programmes, it is less applied in the field of energy and climate change policy evaluations. This paper reports a recent study that has evaluated the effectiveness of the national biofuel policy (NBP) for the transport sector in Malaysia by adapting a TBE approach. Three evaluation criteria were derived from the official goals of the NBP, those are (i) improve sustainability and environmental friendliness, (ii) reduce fossil fuel dependency, and (iii) enhance stakeholders' welfare. The policy theory underlying the NBP has been reconstructed through critical examination of the policy and regulatory documents followed by a rigorous appraisal of the causal link within the policy theory through the application of scientific knowledge. This study has identified several weaknesses in the policy framework that may engender the policy to be ineffective. Experiences with the use of a TBE approach for policy evaluations are also shared in this report.

1. Introduction

Theory-based evaluation (TBE) has been used for over 40 years for evaluating programmes and projects (Suchman, 1987; Weiss, 1995), however it was only in the recent past that it gained popularity within the wider community of practitioners and for applications in other areas, such as for policy evaluations (European Commission, 2013). TBE essentially is an approach in which attention is paid to theories of policy makers that are logically linked together to produce the desired outcomes. The effectiveness of a policy will critically depend on the mechanisms that make the intervention work. A TBE therefore explores the mechanisms that policy makers believe make the policy effective and compare these against evidences gained through researches (White, 2009). Over the years, numerous publications have been produced in literature to develop TBE into a detailed methodological framework, some of which are: (Chen, 2005; Donaldson, 2007; Weiss, 2000; White, 2009).

The application of TBE is not limited to the evaluations of programmes only, instead it has also been used in other areas requiring evaluations, including for evaluating the effectiveness of policies. Whilst the applications of TBE for policy evaluations is not uncommon, the reality however is that it has not been widely applied within the energy and climate change sector (Harmelink, Joosen, & Blok, 2005). Arguably, this is one of the policy sectors that would need effectiveness evaluation the most given that climate change mitigation is an area that is in urgent need of efficacious government interventions, especially since whatever climate policies that are implemented will take time to show effect, whether positive or negative (IPCC, 2013). Given the time limitations, there is a narrow opportunity for experimenting with policy options. Therefore, evaluation of policy effectiveness becomes a critical aspect of climate change policy making.

It is believed that a TBE is a very fitting evaluation technique for assessing the efficacy of climate change policies. One of the key strengths of a TBE is the use of credible research reviews for the critical analysis of the underlying theory of the policy. This reduces the possibility that the informations and empirical contents of the policy theory are being negotiated (European Commission, 2013; Leeuw, 2003). What this means is that, ideologies or even political-correctness has less of an influence on the overall evaluation process, instead the evaluations are mostly based on substantiated and credible research evidences. This is absolutely critical given that it is widely a recognized fact that policies are typically poorly designed, being most often built on consensus based on

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stakeholder's perceptions and belief and very little to do with sound science and knowledge (Brouselle & Champagne, 2011; Fitzpatrick, 2002; Weiss, 1997).

A survey of literature has shown that there are not many practical examples for the use of TBE in evaluating climate change policies. The one relevant publication that was found was by Harmelink et al. (2005), that had conducted an ex post evaluation of 2 climate change policies in the built environment in the Netherlands. Specifically, the Dutch researchers had adopted the TBE approach to evaluate the effects and effectiveness of the Energy Premium Regulation (EPR) scheme and the Long Term Voluntary agreements in reducing the emissions of CO_2 from the built environment in the Netherlands. Given the limited practical examples in literature, and the importance of the subject matter, it felt very appropriate that more case studies are conducted and published widely as means of sharing experiences in the practical use of TBE for evaluating climate change mitigation policies. And so here we demonstrate the use of TBE for evaluating the effects and effectiveness of the national biofuel policy in Malaysia.

2. Problem statements

The population in Malaysia is about 28.6 million in 2010, and according to the Department of Statistics Malaysia (DOSM), this number is expected to rise by 35% to 38.6 million by 2040 (DOSM, 2013), meanwhile the World Bank reports that the country's gross domestic production (GDP) growth in the last 10 years has averaged at about 5% (World Bank, 2015). Studies have shown that rising incomes strongly correlates with higher levels of car ownerships and usages (Webster, Bly, Johnson, & Dasgupta, 1986a; Webster, Bly, Johnson, & Dasgupta, 1986b), as well as with greater trip rates and distances (Schafer, 2000).

Correspondingly, car ownership in Malaysia has seen a dramatic increase from 4.5 million vehicles in 1990 to 18 million vehicles by 2008 (Ong, Mahlia, & Masjuki, 2012); an increase of a substantial 300% in less than 20 years. This corresponds to a vehicle ownership rate of 260 and 660 vehicles per 1000 person in the year 1990 and 2008 respectively. As a result, the transport sector in Malaysia is responsible for a significant 36% of the total energy consumed in 2008, whereby road transport is the leading transportation mode, accounting for about 94% and 96% of total passengers and freights transportation respectively (Ong et al., 2012).

A recent research conducted by the World Bank has in fact shown that the transportation energy intensity in Malaysia has consistently been the highest amongst 11 Asian countries, and worse still, whilst some of these other countries are showing signs of improvement, Malaysia on the other hand, has shown a worsening trend over the years in which the gaps with these other Asian countries have been widening especially in the last 10 years (Fig. 1) (Timilsina & Shrestha, 2009). Moreover, there exists very limited fuel choices for the road transport sector in Malaysia, where currently petroleum-based diesel and gasoline fuels dominate more than 70% of the total energy consumed by the transport sector (Fig. 2) (Ong et al., 2012). The nation's heavy dependence on carbon intensive fossil-based fuels for mobility therefore results in significant GHG emissions contribution from the transport sector.

Furthermore, outcomes of the World Bank's statistical analyses on the Asian transport sector's growth in energy consumption and GHG emissions have revealed that economic activity, population growth and transportation energy intensity are the leading factors driving GHG emissions from this sector in Malaysia (Timilsina & Shrestha, 2009). However, it is unrealistic to expect developing Asian countries to slow down economic growth in order to control GHG emissions, especially since poverty eradication is also a pressing issue for many of these countries. Therefore a critical

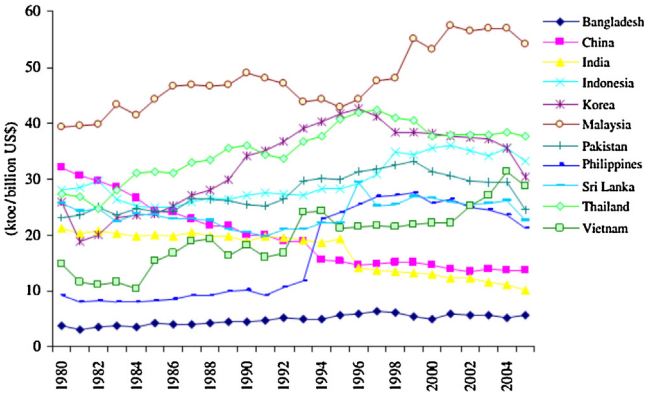

Fig. 1. Transportation energy intensity in several Asian countries from 1980 to 2005 (Timilsina & Shrestha, 2009).

strategy for limiting emissions from the transport sector in Malaysia in the future must, inevitably, result in the eventual decoupling of GHG emissions growth from economic growth. This can be done in several ways, amongst which will involve the switch to cleaner fuels and the modal shift to public transportation.

The NBP is Malaysia's first foray into a bio-based energy economy as a strategic government intervention to drive development and implementation of palm biodiesel as substitute to regular fossil-based diesel. The policy is a first major step that Malaysia has undertaken to introduce alternative forms of energy to complement and partially substitute petroleum for transport application (Abdul-Manan, Baharuddin, & Chang, 2015). This is especially relevant in the context of Malaysia's growing dependence on oil by the transport sector; a sector that is already consuming the most and a sector that is expected to continue to consume even more. The NBP could potentially be the game changer that Malaysia needs in order to induce transition to sustainable mobility. However, the formulations of a biofuel policy based on imprecise assumptions are very risky. The absence of careful policy analysis and logical impact evaluation could lead to policy failures. Failure of the NBP may engender objections to future renewable/clean energy projects in parliament and by the public (Goh & Lee, 2010), and therefore impede the nation's journey towards sustainable development.

3. Malaysia national biofuel policy

Malaysia's first national biofuel policy (NBP) was formulated on the 21st of March 2006, in which in the initial stages the policy was largely championed by the Ministry of Plantation Industries and

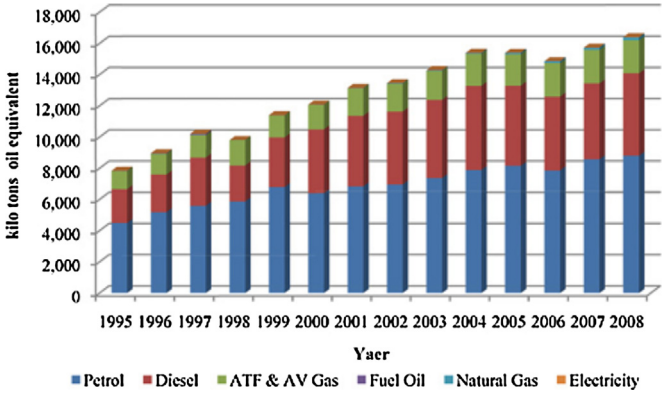

Fig. 2. Transport energy consumption from 1995 to 2008 broken down by energy types (Ong et al., 2012).