SUSTAINABILITY MANAGEMENT STRATEGIES AND IMPACT IN DEVELOPING COUNTRIES

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SUSTAINABILITY MANAGEMENT STRATEGIES AND IMPACT IN DEVELOPING COUNTRIES

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PREFACE

This book intends to share research works in the field of current niche area in sustainability management, beyond modern strategies and showcasing impact in developing countries. The work is a collection of various impactful research works presented during the Regional Conference of Civil Engineering and Sustainable Development Goals 2020 (RCCE & SDGs 2020), which held from 7 to 9 November 2021, co-organised together with UTM, MySUN, and AUN/SEED-Net, Japan. Contributing authors are from Malaysia, Vietnam, and Nigeria, whose research covers a range of sustainable management fields, from construction management, covid-19 impact to socio-economics, green initiatives, engineering, to framework and policies.

The importance of sustainability strategies and identification of impacts in developing countries is a vital element in physical and/or social development. The content of this book is concurrent to the SDGs awareness to provide information to the public, researchers, planners, and stakeholders dealing implicit and explicitly to sustainable development. A huge gratitude to all contributors involved in the production of this book.

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PART A

MANAGEMENT AND STRATEGIES

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CHAPTER 1

A REVIEW ON CARBON TAX FOR MALAYSIA CONSTRUCTION INDUSTRY

Christine Nerisha Anak Stephen Liat, Eeydzah Aminudin, Eric Lou, Gabriel Ling Hoh Teck, Leng Pau Chung, Rosli Mohamad Zin and Rozana Zakaria

ABSTRACT

Oversupplied emission basically will create a global economic downturn, which will lead to the implications for the climate action more broadly. Though the pandemic has test the resilience of carbon initiatives, there is urgency in identifying the carbon tax to strengthen as jurisdiction around the world ambitious in adopting and mitigating the targets as an introductory of the associated policy tools. Based on different situations and disciplines, the carbon tax model is simulated in different ways. The purpose of this study is to compare the available approaches that have been utilised by researchers and to determine the methods that suitable the most. The carbon tax and its influence on the construction sector are being benchmark and discussed as the whole of this document. A bibliometric approach is the method in this study in between the keyword of a carbon tax and the construction industry based on the data available in database of Scopus and Web of Science to foresee the interconnection between the knowledge of understanding and definition. The definition of carbon tax is the Pigovian tax that is designed to reduce the greenhouse gases (GHGs) emitted with aim to act as a green tax and been paid by the

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industries that emitted GHGs as for the carbon emission reduction agenda. The implementation is parallel to the other government policies and in sync to the sustainable development goals.

Keywords: Carbon tax; sustainable development goals; green tax; carbon emissions reduction; construction sector; greenhouse gases

1. INTRODUCTION

In the last decade, the world surface temperature increased 0.74 ± 0.18°C (1.33 ± 0.32°F) as reported by the Intergovernmental Panel on Climate Change (IPCC) in 2007 as the impacts of climate change or global warming. There is a general scientific consensus on global warming that is mainly due to the development of human CO_2 from fossil fuels, so it draws widespread attention to long-term regulation of CO_2 emissions. Failure to resolve climate change could cause an economic loss of about 5% of the world's gross domestic product (GDP) according to Stern's Climate Change Economics Assessment (Stern, 2006). Losses may amount to as much as 20 per cent of world economic production in more extreme scenarios. In comparison, to prevent the worst impacts of climate change, the expense of cutting greenhouse gas (GHG) emissions may be limited to as little as 1 per cent of global GDP annually.

Since a decade ago, countries have been seriously considering what can be done to cope with global warming and reduce carbon emissions. In 1997, the Kyoto Protocol first defined legally binding goals linked to the United Nations Framework Convention on Climate Change for 37 developed countries and the European Community for the reduction of GHG emissions. The latest effort took place in Madrid, Spain, in December 2019, where the worldwide countries and leaders have agreed to make commitments to reduce the emission level from the respective country and European Union agreed on The European Green Deal in which the emission level should reach zero in 2050. It stresses the urgent need to tackle climate change in compliance with the concept of shared yet distinct obligations and capacities, agrees that global temperature rises should be below 2°C, and undertakes to take steps compatible with science and based on equity and finance plans to achieve this objective.

1.1. Construction Industry Carbon Emission

In the environmental protection of both the in-build development phase and the in-service performance condition, the construction sector plays an important role. In 2008, the United Nations Environment Programme (UNEP) estimated that construction of buildings especially is responsible for more than one-third of the total energy usage and carbon emissions (Cheng, Pouffary, Svenningsen, & Callaway, 2008). Construction industries hold the third highest GHG emissions among the United States industrial sectors. One hundred and thirty-one MMTCO2e are emitted by the construction site in 2002 as reported by the United States Environmental

Protection Agency (US EPA, 2008). This value represents 1.7% of total US emissions, or equivalent to 6% of US industrial carbon emissions. The segregation within the total carbon emissions by the construction industry, 76% emissions result from fossil fuel combustion for on- and off-road construction equipment, and 24% come from purchased electricity (Lu, Zhu, & Cui, 2012). Unfortunately, the total emissions from the construction industries should be much higher as EPA estimated excluded the emissions from materials extraction, transportation, productions, consumptions, and disposal. The number of materials used in the construction industries is huge; hence, the magnitude of the carbon emissions of this sector is higher due to the embodied carbon. The four major sources of carbon emissions in construction are embodied building materials (81.6–86.7%), transporting building materials (6.1–8.4%), equipment energy consumption (6.4–8.6%), and disposal of construction debris (Yan, Shen, Fan, Wang, & Zhang, 2010)

Thus, carbon emission from the construction industry is considered critical especially in the operation stage of the life cycle due to the usage of energy to power up the buildings. Policy-makers and the Government shall pay attention to the emission contribution from the construction as the emission can be out of control if not managed properly.

1.2. Malaysia Initiatives to Lower the Country Total Carbon Emission

By 2020, Malaysia's carbon emissions will be expected to reduce by 40 per cent (compared to 2005 levels), and by 2030, the emissions will be reduced by 45 per cent (compared to 2005 levels). Malaysia faces the same dilemma as other emerging nations in decarbonising its energy-centric economy while contending with population growth pressures and high levels of poverty. In 2006, three years before Prime Minister Razak's public declaration, Malaysia began cutting carbon emissions. Many policies and strategic plans have been implemented since then to reorient the country towards a future with fewer carbon-intensive activities. On the list of measures is the addition of palm biodiesel to diesel fuel (The National Biofuel Policy, 2006), the creation of the Sustainable Energy Development Authority to promote the use of renewable energy in power generation (KeTTHA, 2017b), and promotion of public transportation while limiting private vehicle ownership (National Land Public Transport Master Plan).

The government plan contains multisectoral initiatives to reduce GHG emission intensity by 45 per cent by 2030 and to boost economic growth via the use of green technologies. The plan was released in December 2017. Malaysia plans to double its current modal share of 20 per cent in the transportation industry to 40 per cent by 2030 (KeTTHA, 2017a, 2017b). Additionally, 100 per cent of newly registered vehicles must be hybrid or electric, according to the Master Plan (KeTTHA, 2017a). Also on the agenda are proposals to increase the use of compressed natural gas (CNG) and to raise the fuel standards for automobiles, develop green building certification systems, and improve waste management (KeTTHA, 2017a).

For land use and forestry emissions, Malaysia measures carbon intensity both per capita and per unit of GDP. GHG emissions in 2011 were 9.97 tonnes

CO_2 equivalent per capita and 0.41 tonnes CO_2 equivalent per thousand ringgits, respectively (a 9.8 per cent and a 23 per cent drop in intensity from 2005 levels). 2011 GHG emissions were 0.94 tonnes CO_2 equivalent per capita and 0.04 tonnes CO_2 equivalent per thousand Ringgit (respectively, 20.7 and 32.5 per cent decreases from 2005 levels) when LULUCF removals are included (Ministry of Natural Resources and Environment, 2015).

1.3. Carbon Tax in General

Pigovian tax, named after the economist Pigou, is the genesis of carbon taxes as a charge on market activity that creates a 'disservice'. In principle, a Pigovian tax corrects for market failure by adding a charge to the market price, at a rate that represents the societal harm of the activity, to correct for undesired or inefficient market outcomes. Coase (1960) referred to these expenses as 'externalities', or societal costs that are not reflected in private market prices. In economic theory, a carbon tax is generally considered the 'first-best' or 'optimal' option for addressing the externality of human carbon dioxide emissions (Bertram et al., 2015). Critics do, however, point out that carbon prices are not without flaws. 'Climate capitalism' (Newell & Patterson, 2010) as well as restricted technocentric and economic worldviews arising from restrictive monodisciplinary perspectives have been implicated in the prioritising of carbon taxes in political economics (Kirby & O'Mahony, 2018).

2. METHODOLOGY

The research questions are 'What is the impact of the carbon tax in the construction industry?', 'Will carbon tax will impact the legislation of the construction management?', 'Do carbon emissions from the construction will reduce if a carbon tax is implemented?', and 'Why a carbon tax is preferable to move the conventional method to a greener technology?'. The databases selected in this review are the Scopus and Web of Science due to the reliability of the data and quality plus the available resources in the databases. Next, after used the keywords such as 'Carbon Tax AND Construction Industry', 'Carbon Tax AND Green Building Strategy', and 'Impacts of Carbon Tax', the screening will be conducted to select the best references. Due to the lack of availability of carbon tax in construction industry research, other impacts from different sectors were analysed and assimilated to the situation of the construction industry. VOSviewer software is used to illustrate the carbon tax relationship with the construction industry. VOSviewer is a program to build and visualise bibliometric networks. For example, these networks can involve journals, scholars, or individual publications, and they can be established based on citation, bibliographic coupling, co-citation, or relationships with co-authorship. Text-mining functionality is also available in VOSviewer, which can be used to build and visualise co-occurrence networks of important words extracted from a body of scientific literature.

3. CARBON TAX AS CARBON EMISSION REDUCTION STRATEGY

Carbon taxes value carbon dioxide that is released to the atmosphere, thus the impact of the carbon dioxide emission must be cost to carter the bad impacts (Sumner, Bird, & Dobos, 2011). While this role is necessarily given by all carbon taxes, policy objectives can differ. Carbon taxes are mainly used to minimise GHG emissions by putting emissions costs on the table, but carbon tax may also boost revenues to support carbon reduction measures or to build demand. Some countries are not yet ready to implement carbon tax especially the developing country due to the fear of tax will add more burden to the country.

A carbon tax can act as a carbon emission reduction strategy for the construction sector to support the current legislation. Green buildings strategy is legislated for sustainable energy development and the construction activities that used low-carbon technology as well as use available natural resources (Conefrey, Gerald, Valeri, & Tol, 2013). The purpose of green buildings is to reduce and minimise the carbon emissions from the construction materials, manufacturing machines, and labour that can ensure an indoor environment quality for building occupants (Chen, & Jim, 2011; Roe & Mell, 2013). A carbon tax can complement the green building strategy to fully operate as the carbon emission reduction strategy. The carbon footprint of green buildings is the calculated carbon dioxide emissions for the whole life cycle of the buildings, which can help to identify the critical area for energy consumption management and identify the pollutions. It is vital to determine the sources of the carbon emissions that come from a direct activity and indirect carbon emissions from the construction process (Tsai, Yang, Huang, & Wu, 2016). Construction firms are responsible for measuring and reporting the green building carbon footprint for occupants and achieving the goal of reducing CO_2 emissions. It is not one-sided responsibility; hence, construction industry practitioners must overcome this problem and counter back with solutions such as using recycled material for construction, deploy higher productivity machinery to the site, and use greener technology that emits less carbon dioxide as less energy usage.

3.1. Relationship between the Carbon Tax and Construction Industry

A carbon tax's primary goal is to reduce emissions of GHGs; most existing carbon policies lack defined processes or standards for determining the success of policies in lowering emissions, although some have sought to measure their benefits. Cumulative carbon tax effects are difficult to assess since numerous things influence overall carbon dioxide emissions, including economic development and other environmental regulations. Considerations for design are based on capital expenses and viability from the developer's point of view. Prospective renters must pay a carbon fee for the whole life of the home. As a result, the developers would only be affected by a small fraction of the additional cost if the building is not commissioned for its use. Because they are not accountable for building energy conservation and do not have a long-term interest in buildings

(British Standards Institution (BSI), 2004), architects, consultants, and contractors have no duty or legitimate rationale for changing their activities. Cost savings are created when customers switch from more expensive high-efficiency equipment to less-expensive high-efficiency equipment within the same technology class. Customers will also gravitate towards better-performing models within the same technology class as a result of the carbon tax.

Using content analysis via analysing the distribution of the keywords of the publication, VOSviewer software is chosen as the medium to interpret the data. The keyword co-occurrence network of the carbon tax and construction industry (see Fig. 1.1) was constructed by the VOSviewer software. The size of the nodes and words illustrated the weights of the nodes. The bigger the size of the node and word, the heavy the weight of the occurrence. The distance between two different nodes shows the strength of the relation between the two nodes. Shorter distances give the meaning of a strong relationship between the two nodes. The line between two nodes or keywords revealed that the keywords have appeared together. A thicker line means more co-occurrence between the two keywords. The nodes of a similar colour are called a cluster.

VOSviewer had helped to divide the related publications into five clusters. Referring to Table 1.1, the keyword of 'emission control' has the highest occurrences of 70. Other keywords are 'pollution tax' (42), 'carbon taxes' (51), 'carbon dioxide' (50), and 'carbon' (47).

Through the content analysis, the relationship between the carbon tax and the construction industry can be revealed. Carbon tax acts as the emission control legislation to reduce the amount of carbon dioxide emissions from the construction sector. The carbon tax is a pollution tax, where the tax is based on

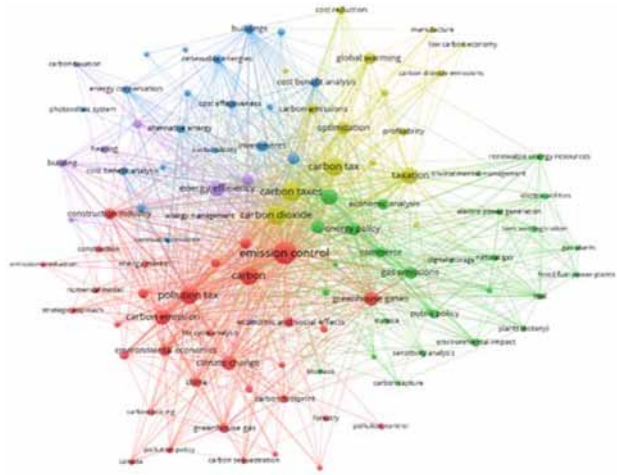

Fig. 1.1. Keyword's Co-occurrence Network of the Carbon Tax and Construction Industry-related Publications. Adapted from the Software VOSviewer Using the Data Extracted from Scopus Database.