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ENVIRONMENTALLY-EXTENDED INPUT-OUTPUT ANALYSIS IN ENVIRONMENTAL ASSESSMENT

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Sustainability has become the key goal in every aspect of the environment especially in the diverse urban systems. Sustainable practices require a controlled setting within an urban system where their practicality and efficacy could be assessed. The aim of the thesis is to establish an environmental assessment tool based on urban metabolism approach to assist decision-making during environmental and economic assessment. The outcome provides understanding on the means of integrating carbon footprint and monetary factor to oversee the expenditure of a nation in general, or a household or an individual in particular, in relation to global warming potential. This study applied a retrospective cross sectional study to provide a form of environmental assessment in developing economic-environmental input-output model for greenhouse gases emission monitoring and climate change adaptation. Methodologically, the potential impact from economic sectors' contribution on greenhouse gas emissions which eventually leads to global warming and climate change was quantitatively assessed. Firstly, the contribution of greenhouse gas emission from each economic activity was examined. Secondly, the association of greenhouse gas emissions with gross output value from each economic activity was assessed to ascertain the greenhouse gas intensity. Finally, a preliminary environmental-economic input-output tool were developed for potential global warming forecasting assessment and improving the surveillance system of each target economic sector concerning climate change. The input-output analysis method development found that Barcelona with 14 economic sectors has carbon dioxide emission to be 24.44 kg CO_2- eq./cap/day. The method adaptation to Malaysia resulted with greenhouse gas emission of all 120 economic activities with 4.87 kg CO_2-eq./cap/day. Greenhouse gases from waste management was not captured in the input-output matrices. The waste management section was managed but the introduction to Material Flow Analysis approach which resulted with 4.5 kg/capita/ day of solid waste for Klang Valley. The economic input-output model of a nation or region is an analytical tool that describes the structure of one nation or region's economy. A derived matrix from the economic input-output table is expanded to express global warming potential which describes its total global warming impact relative to carbon dioxide emission over a set period of time. The estimation of carbon footprint from monetary fluxes is vital in the environmental health impact assessment as sustainable urban planning and sustainable economy are complimentary of one another. This study contributes to quantitatively analyse the physical input-output relationships among the socioeconomic components with the findings on the distribution of environmental impacts, thereby providing scientific model support to guide restructuring of metabolic system especially urban metabolic system. The use of publicly available data to assemble the matrix representation enables comprehensive assessment of the environmental impacts of a product or service with effective cost, in a relatively fast and high-technology manner.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Industrialisation, urbanisation and globalisation are interrelated with each other in shaping the growth of a country. Growth in terms of economy of a country is generally aided by industrial activities which further drive the process of urbanisation. It is broadly accepted that the expansion of industries and urban population have accelerated the economic growth (Chen, Zhang, Liu, & Zhang, 2014). It has been revealed that developed countries have a higher level of Gross Domestic Product (GDP) per capita (United Nations Department of Economic and Social Affairs, 2011), which GDP is used to measure the economic growth and the monetary value of all the finished goods and services produced within a country in a specific time period.

Developing countries around the world intensify their economic accomplishments predominantly through industrial activities. The increase in the number of industrial activities has led to substantial migration of people from rural areas to more urbanised areas (de Brauw, Mueller, & Lee, 2014; Teriman, 2012). As a result, more and more urbanised areas are developed to cater to the needs of the people. Though urbanisation has greatly accelerated the economies of most countries (Cheng, Chiang, & Tang, 2006; De Sherbinin, Alex, 2007; Xu & Lin, 2015), it also has brought with it several disadvantages. Urbanisation sets off an increase in population, increase in demand of natural resources and introduction of pollutants into the environment which would result in environmental impacts to the cities.

Development is often carried out without fully considering the future consequences and creates numerous environmental impacts including increased air and water pollution (Gao & Liu, 2012; Salahodajev, 2014), climate alteration (Argüeso, Evans, Fita, & Bormann, 2014; Grimm et al., 2013), emergence and re-emergence of disease (Zell, 2004; Adhikari, Sapkota, Khan, & Maskay, 2016; Tong et al., 2016), insufficient housing and sanitation facilities (Heischbourg, Guhathakurta, Hagen, Petsch, & Müller, 2011; McGranahan, 2015) as well as overcrowding (McGranahan, 2015; WHO, 2014), and traffic congestion (Khreis et al., 2016;

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