PERFORMANCE OF THE GREEN HOUSE GASSES (GHG) EMISIONS FOR STATE OF MELAKA

BY

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A thesis submitted in fulfilment of the requirement for the degree of Master of Science (Built Environment)

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ABSTRACT

Thriving the balance between development activities and its environment consequences measured in carbon emission need to be the State's concern as an actor at sub-national level. This is to execute the National target voluntary reduction on carbon emission which require proper assessment method which comply to global standard. The research aims to analyses and structured -sectoral & scope- carbon emission in terms of the greenhouse gas, GHG emission performance as manifested in the vision of Melaka Green Technology city state by 2020 and identify its planning implication. The Global Protocol for Community-Scale Greenhouse Gas Emissions, GPC assessment framework deploy to analyse its sectoral and scope performance. Based on the computation BASIC+ software, the data from an output of GHGs emission translated into carbon emission equivalence. It was found that major sources of GHG emissions are stationary energy (52.95%), transportation (27.04%), waste (18.52%), agriculture, forestry & other land use (AFOLU) (1.49%). Based on internal grid emissions within the city limit, GHG emissions from sources within the city border, or Scope 1, dominate at 6,133,735.19 tCO_2e, compared to scope 2, 2,777,438.73 tCO_2e. In addition, carbon emission intensity is computed by dividing the total quantity of carbon emissions by the population of Melaka. Each person's contribution to the state's increasing GHG emissions is reflected in the increase in emissions per capita from 6.19 tCO_2e (2013) to 6.88 tCO_2e (2017). According to the findings, Melaka's intensive green technology initiative is insufficient to reduce the city's overall carbon emissions intensity. While fragmented urban expansion relies heavily on stationary energy and single-car transportation, reforming urban development in tandem with a climate plan is required to reduce per capita emissions. According to the study's suggestions for land use and urban evolution, encourage increased density, mixed-use, green, and compact developments. Because additional green space helps to store carbon, particularly in mixed and urban development, careful planning is essential to catalyse green space within the Melaka city centre and its heritage treasures under the jurisdiction of the UNESCO World Heritage Site. Flexible land use policies that enhance climate resilience, adaptation, and mitigation are urged to help Melaka achieve a compact polycentric urban reconfiguration.

خلاصة البحث

إن ازدهار التوازن بين أنشطة التنمية وعواقبها البيئية المقاسة بانبعاثات الكربون يجب أن يكون مصدر قلق الدولة بصفتها جهة فاعلة على المستوى دون الوطني .هذا لتنفيذ الهدف الوطني الخفض الطوعي من انبعاثات الكربون والتي تتطلب طريقة تقييم مناسبة تتوافق مع المعايير العالمية .يهدف البحث إلى تحليل وتنظيم – قطاعي ونطاق – لانبعاثات الكربون من حيث غازات الاحتباس الحراري، وأداء انبعاثات غازات الدفيئة كما يتجلى في رؤية ولاية مدينة ملاكا للتكنولوجيا الخضراء بحلول عام 2020 وتحديد آثارها التخطيطية .يتم نشر البروتوكول العالمي لانبعاثات غازات الاحتباس الحراري على نطاق المجتمع، وإطار تُترجم ، + BASIC لتحليل الأداء القطاعي والنطاق .استنادًا إلى برنامج الحساب GPC عمل تقييم البيانات من مخرجات انبعاثات غازات الدفيئة إلى معادلة انبعاثات الكربون .وجد أن المصادر الرئيسة لانبعاثات غازات الدفيئة هي الطاقة الثابتة)52.95٪ (والنقل)27.04٪ (والنفايات)18.52٪(استنادًا إلى انبعاثات .(1.49٪) (AFOLU) والزراعة والغابات واستخدامات الأراضي الأخرى ،الشبكة الداخلية داخل حدود المدينة، تهيمن انبعاثات غازات الدفيئة من المصادر داخل حدود المدينة ،أو النطاق 1 ، على 6،133،735.19 طن من مكافئ ثاني أكسيد الكربون، مقارنة بالنطاق 2 طن من مكافئ ثاني أكسيد الكربون .بالإضافة إلى ذلك، يتم حساب كثافة 2،777،438.73 انبعاثات الكربون بقسمة الكمية الإجمالية لانبعاثات الكربون على سكان ملاكا .تنعكس مساهمة كل شخص في زيادة انبعاثات غازات الاحتباس الحراري في الولاية في زيادة نصيب الفرد من الانبعاثات من طنًا من مكافئ ثاني أكسيد الكربون)2013 (إلى 6.88 طنًا من مكافئ ثاني أكسيد الكربون 6.19 وفقًا للنتائج، فإن مبادرة ملاكا نحو التقنية الخضراء المكثفة غير كافية لتقليل كثافة انبعاثات .(2017) الكربون الإجمالية في المدينة .بينما يعتمد التوسع الحضري المجزأ بشكل كبير على الطاقة الثابتة والنقل

بسيارة واحدة، فإن إصلاح التنمية الحضرية جنبًا إلى جنب مع خطة المناخ مطلوب لتقليل نصيب الفرد من الانبعاثات.

وفقًا لاقتراحات الدراسة لاستخدام الأراضي والتطور الحضري ، شجع على زيادة الكثافة والاستخدام المختلط والتطورات الخضراء والمضغوطة .نظرًا لأن المساحات الخضراء الإضافية تساعد في تخزين الكربون ، لا سيما في التنمية المختلطة والحضرية ، فإن التخطيط الدقيق ضروري لتحفيز المساحات الخضراء داخل مركز مدينة ملقا وكنوزها التراثية تحت سلطة موقع التراث العالمي لليونسكو .نحث سياسات استخدام الأراضي المرنة التي تعزز مرونة المناخ والتكيف معه وتخفيف آثاره لمساعدة ملقا على تحقيق إعادة تشكيل حضري متعدد المراكز.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a thesis for the degree of Master of Science (Built Environment).

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Dean, Kulliyyah of Architecture and Environmental Design

DECLARATION

I hereby declare that this thesis is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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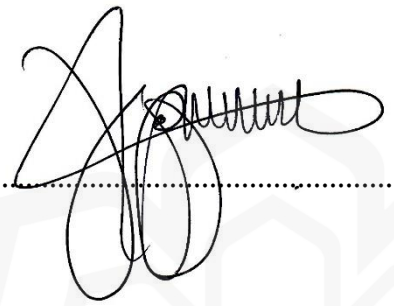
Signature:  Date: 24/08/2022

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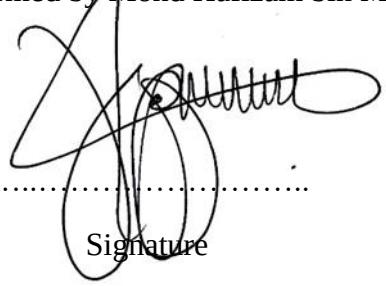

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LIST OF ABBREVIATIONS

ADB	Asian Development Bank
AFOLU	Agriculture, Forestry and Other Land Use
BAU	business-as-usual
BEI	Baseline Emission Inventory
BUR	Biennial Update Report
BUR2	Second Biennial Update Report
C40	C40 Cities Climate Leadership Group
CAAM	Lembaga Penerbangan Awam Malaysia
CB	consumption-based
CBOs	community-based organisations
CDP	Carbon Disclosure Project
CEI	carbon emission intensity
CH4	Methane
CI	carbon intensity
CNG	Compressed Natural Gas
CO2	Carbon Dioxide
CO2e	carbon dioxide equivalents
COP21	2015 United Nations Climate Change Conference
DPSC	Direct Plus Supply Chain
EPU	Economic Planning Unit
ESA	Environmentally Sensitive Areas
ETS	Electric Train Service
GCAP	Green Cities Action Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GPC	Global Protocol for Community-Scale Greenhouse Gas Emission Inventories

GPSC	Global Platform for Sustainable Cities
GWP	Global Warming Potential
ICLEI	Local Governments for Sustainability
IEAP	International Local Government Greenhouse Gas Emissions Analysis Protocol
INDC	Intended Nationally Determined Contribution ()
IOA	input–output analysis
IPAT	Impact, Population, Affluence, Technology
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ISC	International Standard for Greenhouse Gas for Cities
IWK	Indah Water Konsortium
KTMB	Keretapi Tanah Melayu Berhad
LCA	Life Cycle Analysis
LCCF	Low Carbon City Framework
LED	Light Emitting Diode
LLM	Lembaga Lebuhraya Malaysia
LPG	Liquified Petroleum Gas
LTO	Landing and Take-Offs
MAHB	Malaysia Airlines Holdings Berhad
MC	Methane Commitment
MESTECC	Ministry of Energy, Science, Technology Environment and Climate Change
MSW	Municipal Solid Waste
MGTC	Malaysia Green Technology Corporation
MKZ	Melaka International Airport
MRT	Mass Rapid Transit
MWh	Megawatt hour
N2O	Nitrous Oxide
NC	National Communication
NC3	Third National Communication

NDC	Nationally Determined Contributions
NGOs	non-governmental organisations
NPP	National Physical Plan
PNG	Piped Natural Gas
RDF	Refuse Derived Fuel
SAMB	Syarikat Air Melaka Berhad
ST	Suruhanjaya Tenaga
tCO2e	tonnes of carbon dioxide equivalent
TNB	Tenaga Nasional Berhad
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WBS	World Business Council for Sustainable Development
WRI	World Resources Institute

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

The study is concerning the analysis of greenhouse gas, GHG emission performance resulted from the various development in activities in Melaka State and evaluate its planning implication. Melaka visioned to be the Melaka Green Technology City State by 2020 as to support the National agenda on voluntary carbon emission reduction by 45 % per GDP by 2030 based on 2005 baseline data as well as the global climate change challenge. For development growth, Melaka state has a goal to become a high-income, low-carbon developed nation by 2020, with a minimum GDP per capita of USD15,000 (Krishnan et al., 2014). Therefore, various development activities conducted has an effect in terms of carbon emission which needs to be measured through greenhouse gas, GHG performance. To catalyse the economic development and the aim for green technology state, several green initiatives execute to reduce carbon emissions. Among the green initiatives are community scale of solar panel, mega valley solar, electric buses, bicycle lane, waste recycling, green building rating tools at the state level and many more.

Melaka state which famous as the historical place tourism destination has population 862,500 which occupying a total of 1,663.1 Sq. km of land. Melaka location map as depicted on **Error! R eference source not found..** The majority of this land is used for agricultural activity, 82 percent of the total and located in Alor Gajah (673.8 sq. km) and Jasin District (689.2 sq. km). Central Melaka, which account the highest number of urban densities with a population of 522,200 in the area 300.1 sq. km account for only 18% of the total administrative area. The central Melaka covers the historic Melaka under Melaka Historical City Council and Hang

Tuah Jaya (administrative center of Melaka) under Hang Tuah Jaya Municipal Council. Agricultural is still predominant areas of Alor Gajah and Jasin that makes up 82 percent of the total area. It has with it a slightly lower population of about 331,000 people in the year 2013 compared to Central Melaka. The statistic describes a high density of population in Central Melaka which follows by the focus of economic activities surrounds that area (Melaka State Economic Planning Unit, 2017) .

Map 1 State of Melaka

(Source: http://www.maphill.com/malaysia/melaka/location-maps/physical-map/)