

**ASSESSMENT OF COMPREHENSIVE LOCAL LAND USE PLAN AND
LOW CARBON CITIES IN MALAYSIA**

NORSA'ADAH BINTI HAJI SHAMSUDIN

UNIVERSITI TEKNOLOGI MALAYSIA

**ASSESSMENT OF COMPREHENSIVE LOCAL LAND USE PLAN AND
LOW CARBON CITIES IN MALAYSIA**

NORSA'ADAH BINTI HAJI SHAMSUDIN

A thesis submitted in fulfilment of the
requirement for the award of the degree of
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Department of Urban and Regional Planning
Faculty of Built Environment and Surveying
Universiti Teknologi Malaysia

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DEDICATION

I would like to dedicate this thesis to my late father, Haji Shamsudin bin Haji Abdul Rahman and my beloved mother, Hajjah Patmah binti Haji Mokhtar, who've given their blessing for me to pursue this master's study. For my siblings and friends, my appreciation for your kind prayer and encouragement. To all my lecturers, thank you for your guidance and inspiration.

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ABSTRACT

Asia is the major contributor of GHG and CO₂ emission in the world. Prior to that, many Asian countries begin to implement Low Carbon Cities initiatives in their comprehensive local land use plans to mitigate climate change. The purpose of this study is to assess the comprehensive local land use plan and Low Carbon Cities in Malaysia. Content Analysis Method is used in the study to assess and analyse three (3) Low Carbon Cities from three (3) local jurisdictions by qualitative and quantitative, on how well these plans recognized the concepts of low carbon city in preparing for climate change mitigation and adaptation. Five (5) protocol components and 43 indicators were used in the process and Descriptive Statistics for Plan Quality result shows that the plans reflect adequate awareness but with limited analysis for climate change; although the actions taken varied widely in scope and content in their plans. The results for Total Standardized Scores exhibit City of Shah Alam at (26.58/50), Cyberjaya of Sepang at (37.08/50) and The Federal Territory of Putrajaya at (39.55/50). Factual Basis score lowest (Mean = 6.11) while Inter-organizational Coordination and Capabilities score highest (Mean = 7.78). The results for Indicator Performance of Plan Component in Coverage shows Implementation and Monitoring is the lowest at (75.0%) while Inter-organizational Coordination and Capabilities is the highest at (100%). The results for Indicator Performance of Plan Component in Depth indicates Factual Basis has the lowest percentage of (58.3%) and Inter-organizational Coordination and Capabilities has the highest percentage of 77.8%. This study concludes that Low Carbon City action plans at local jurisdictions is a dynamic and long-term process. As this study is limited to a single period it may not reflect the actual planning progress. Plans and policies require time to develop, therefore longitudinal analysis is more reliable to find the contributing factors to policy learning responding to the climate change issues at local level.

ABSTRAK

Benua Asia merupakan penyumbang terbesar di dunia dalam peningkatan karbon dan gas dalam udara. Oleh itu, banyak negara di Asia telah mula melaksanakan inisiatif Bandar Rendah Karbon dalam pelan guna tanah bagi menangani masalah perubahan cuaca yang berpunca daripada perkara tersebut. Tujuan kajian ini dibuat bagi menilai kebolehpayaan pelan komprehensif guna tanah dalam pelaksanaan Bandar Rendah Karbon di Malaysia. Kaedah Analisa Kandungan (Content Analysis) telah digunapakai dalam kajian ini bagi menilai secara kualitatif dan kuantitatif tiga (3) buah Bandar Rendah Karbon dalam tiga (3) kawasan pentadbiran kerajaan tempatan, serta kebolehpayaannya mengenalpasti konsep Bandar Rendah Karbon. Lima (5) komponen protokol dan 43 indikator telah digunakan bagi proses penilaian tersebut dan keputusan Kualiti Pelan Secara Deskriptif dan Statistik menunjukkan bahawa walaupun erdapat kesedaran terhadap isu perubahan cuaca serta pelbagai cadangan telah dimasukkan ke dalam pelan perancangan guna tanah dan pelan tindakan Bandar rendah Karbon, namun kajian dan analisa tidak dijelaskan dengan terperinci. Hasil keputusan Jumlah Skor Standard kajian ini menunjukkan Bandaraya Shah Alam mendapat skor (26.58/50), Cyberjaya (37.08/50) dan Wilayah Persekutuan Putrajaya (39.55/50). Manakala keputusan kajian bagi Indikator Pelaksanaan Dalam Komponen Pelan Secara Liputan menunjukkan Pelaksanaan dan Pemantauan mendapat peratusan terendah (75.0%), dan Koordinasi dan Keupayaan Antara Organisasi mendapat peratusan tertinggi (100%). Keputusan kajian bagi Indikator Pelaksanaan Dalam Komponen Pelan Secara Terperinci menunjukkan Fakta Asas (Factual Basis) mendapat peratusan terendah (58.3%) manakala Koordinasi dan Keupayaan Antara Organisasi mendapat peratusan tertinggi (77.8%). Dapat dirumuskan bahawa pelaksanaan Bandar Rendah Karbon di peringkat Kerajaan Tempatan merupakan proses jangka panjang. Oleh kerana kajian ini dijalankan dalam tempoh masa yang terhad, agak sukar untuk menilai kemajuan sebenar perancangan tersebut. Pelan dan Polisi memerlukan masa untuk dilaksanakan dengan sempurna. Oleh itu, kajian jangka panjang adalah lebih bersesuaian bagi melihat faktor keberkesanan pelaksanaan polisi terhadap isu perubahan cuaca di peringkat kerajaan tempatan.

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LIST OF ABBREVIATIONS

GHG	-	Greenhouse Gas
CO ₂	-	Carbon Dioxide
GDP	-	Gross Domestic Product
LCCF	-	Low Carbon Cities and Framework
MESTECC	-	Ministry of Energy, Science, Technology, Environment and Climate Change
LEED	-	Leadership in Energy and Environmental Design
PHJKR	-	Penarafan Hijau Jabatan Kerja Raya
MyGHI	-	Malaysia Green Highway Index
GreenRE	-	Green REDHA
CASBEE	-	Comprehensive Assessment System for Built Environment Efficiency
MyCREST	-	Malaysian Carbon Reduction and Environmental Sustainability Tool
SZEA	-	Standard Zoning Enabling Act
LCE	-	Low Carbon Economy
LCD	-	Low Carbon Development
LCS	-	Low Carbon Society
LCC	-	Low Carbon City
LCW	-	Low Carbon World
SC	-	Sustainable City
SD	-	Sustainable Development
MBSA	-	Majlis Bandaraya Shah Alam (Shah Alam City Council)
RT	-	Rancangan Tempatan (Local Plan)
DOSM	-	Department of Statistic Malaysia

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CHAPTER 1

INTRODUCTION

1.1 Introduction

It is 2020 and the world is in the haze of resolving the climate change issues and global warming since Rio de Janeiro 1992. Evidently shown in many studies the critical condition of the environment caused by Greenhouse Gases (GHG) and CO₂ emissions. Scientifically concluded that the most effective way in long-term effort to stall the global warming is by reducing the emissions of GHG and CO₂, largely contributed from the burning of fossil fuels in the cities; mostly in all sectors including the industry, transportation, and domestic sectors of economies (Lou et al., 2018). This supports the fact that emerging of megacities and cities around the world have profound implications to the climate change. Studies by Gouldson (2016) mentioned that cities are the central of global climate mitigation as more than half of the world population occupying the urban areas, and consumed most of the global energy and energy related to GHG (Gouldson et al., 2016). According to the United Nations (UN); in 2014, 54% of the world's population inhabits the urban areas. Then by 2050 it is estimated that urban areas will have 66% of the world's population. The growth of urban population is escalating from 746 million in 1950 to 3.9 billion in 2014 with 53% of this number is in Asia (Nuzir and Diwanker, 2014). More studies have approved to the fact that cities play a big role in combating the global warming issues. Liang (2010) stresses that the city is an important fundamental element in the social economic development and that Low Carbon City as the only way to realise Sustainable Development as it may support to energy saving, discharge reduction and development of Low Carbon Economy (Liang, 2010). Prior to that, many cities have begun to formulate policies in reducing the CO₂ emissions and defined Low Carbon City mission in their cities development blueprints. For instance, 1,050 cities in the United States, 40 cities in India, 100 cities in China, and 83 cities in Japan. These cities have started to implement various low carbon programs in the sectors of building, industry, and others (Lou et al., 2018).

This chapter shall provide an overview of the research background that includes the problem statement, research gap, aim and objectives, research question, scope and significance of the study and lastly the overall structure of the thesis.

1.2 Research Background

Malaysia is serious in joining the global forces in combating the climate issue. It was in 2002 that Malaysia ratified the commitment to the Kyoto Protocol, then voluntarily agrees to reduce its GHG emissions intensity (per unit of GDP) up to 40% by 2020 and later intend to reduce up to 45% by 2030 (Begum, 2017). Malaysia transformed from an agriculturally based economy to the industrialized economy since the last four decades, which contributed to 235.6% carbon emissions increase between 1990 and 2005. The emission increased was largely due to the rise in national energy demand of 210.7% between 1990 and 2004, including the rising number of automobiles and industries (Zaid et al., 2015) As Malaysia ranked 51st place of CO₂ emissions, ranked by 2009 emissions (only fossil fuels and cement manufacture, metric tons per capita) (UN, 2014), Malaysia is taking the issue more seriously to another level. As study by the Ministry of New and Renewable Energy (MNRE) in 2011, of observed and projected climate change by 2050 showed increasing figures in temperature, rainfall and sea level rise (Begum, 2017), urging the government to move aggressively in promoting low carbon development. In 2010, the Department of Statistics Malaysia (DOSM) recorded 20 major cities in Malaysia with a population of more than 300,000, including 10 largest urban agglomerations, metropolitan areas or conurbations which are the Greater Kuala Lumpur, Greater Penang, Iskandar Malaysia, Greater Kuching, Ipoh, Greater Kota Kinabalu, Melaka, Kuantan, Alor Setar and Kota Bharu (DOSM, 2010). Due to the rapid urbanization in Malaysia, there has been an increased number of municipalities too since year 2000 with the total of 154 local council in Malaysia. Out of that number, 15 was granted City Council status, 40 municipal council and five (5) modified local government (JKT, 2018).

The federal government through the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) launched the Low Carbon Cities and Framework System (LCCF) as to guide and help the assessment of cities development and support the Sustainable Development effort in Malaysia. It is expected to provide

an equivalent GHG resulting from human activities in the urban areas so to bring up awareness of the people towards GHG reduction (KeTTHA, 2011). LCCF is a performance-based system that function to capture the environmental impact in an actual condition of a development in relation to total carbon emissions. It prioritized the performance criteria that is significantly gives an impact to the environment and also ensure the priority reflected to the targeted goal (KeTTHA, 2017). In achieving its target to combat the climate change and reduce GHG emissions, the government full forced the promotion of LCCF throughout the country to encourage participation by the local authorities. Although there are still debates on its implementation method of One-System Approach and a City-Based Approach, there has been a growing interest in LCCF as reflected in the increasing number of partners, from nine (9) local authorities in 2012 to 52 in 2017. Out of this, 22 partners are working on their baseline development in 2017 (NST, 2017) and additional of one (1) partner evaluated in 2018 with a total of 23. Until 2018, LCCF has awarded Diamond Recognition (DR) to five (5) partners and Provisional Certificate (PC) to twelve (12) partners, and having 56 strategic partners altogether. To date, as mentioned by the acting Deputy Minister of MESTECC, 25 local authorities and two (2) universities have adopted LCCF and the ministry is targeting that there will be 52 low carbon cities adopting LCCF by 2020 (Wong, 2017).

In the same effort, the Federal Department of Town and Country Planning (JPBD) issued Green Neighbourhood Planning Guidelines in 2010 as part of the National Low Carbon Framework, particularly looking at eight (8) planning principles including land use and site selection (Siong and Tsong, 2011). Other than LCCF, in the global arena there are other measuring and rating tools in place such as Building Research Establishment Environmental Assessment Method (BREEAM), Comprehensive Assessment System for Built Environment Efficiency (CASBEE – Japan), Green Star (Australia), Green Mark (Singapore) and LEED (US and Canada). In Malaysia, there are also other rating tools available which have similarities, differences and general trends. Criteria based rating tools for building only are Melaka Green Seal and Penarafan Hijau JKR (PHJKR); measurement based rating tools for building is Green Pass; measurement based rating tools for township is LCCF; criteria based rating tools for infrastructure assessment is MyGHI; criteria based rating tools for both the individual building and the whole township are GBI and GreenRE;

measurement based rating tools for both the individual building and the whole township is CASBEE Iskandar; and lastly MyCREST as the only tool that employs both criteria based and measurement based rating tools assessment of individual building (Hung & Fuad, 2018), while the newest measuring tool in the industry is Sustainable Low Carbon Building Assessment by Malaysia Sustainable Energy Development Authority (SEDA).

LCCF identify the parameters for low carbon city which are four elements; urban environment, urban transport, urban infrastructure and building. There is a total of 13 performance criteria and 35 sub-criteria in LCCF and shall be used in this study together with the existing protocol element and indicator from previous research. The criteria and sub-criteria are relevant as mostly are directly or indirectly related to land use planning. Land use planning has become known to be closely related to global environmental change and Sustainable Development. Looking firstly at the scope of Low Carbon City, secondly, the present condition of Malaysia on carbon emission against the emerging cities backdrop and Malaysian Government efforts to monitor the developing cities adopting low carbon city concept using various measuring tools, proves that there are issues of Low Carbon City evaluation becoming important. The evaluation is used to confirm if a city is indeed low-carbon or the least, shows the gap between the city present state and their low carbon objectives, and to identify the criteria that is relevant in creating a successful Low Carbon City.

1.3 Problem Statement

At this point, Malaysia is facing with an unresolved climatic issue that require serious attention from the government. Reports has shown in general that the climatic condition in Malaysia is not improving much. This happened as Malaysia keeps on developing, with increasing numbers of new cities and the growth of existing cities. Therefore, the government has taken a step further by introducing and implementing national frameworks, policies and guidelines towards Sustainable Development, green campaign and low carbon approaches for the past few years. However, other than the rating received from the existing assessment tools available, there is no evaluation done academically to check on how much the low carbon cities exercise is progressing in relation to land use planning and whether it is on the right track. Are the low carbon

cities low carbon enough? This study is important as a check and balance to the existing rating achieved. The second issue is the importance of the comprehensive local land use plan to build low carbon cities. The question arises of how comprehensive land use plan can assist and encourage decision at local government level towards low carbon intention.

1.4 Research Gap

Review of literature suggests that a number of studies have been carried out on evaluating low carbon cities globally with the application of various framework and indicator (Khanna, Fridley, & Hong, 2013). There is abundant literature on low carbon cities, mostly deals with impact studies, modelling and a few on measuring performance (Hasyimi and Azizalrahman, 2018). China scholars had done many studies on low carbon approach and its implementation on urban planning due to aggressive steps of the China Government in building low carbon cities. Among the earliest effort by its government was in 2010 by launching thirteen pilot programs on low carbon development with five (5) low carbon provinces and eight (8) low carbon cities. (Khanna, Fridley, & Hong, 2013) Through their evaluation, it was found that the eight (8) pilot cities is progressing in establishing low-carbon plans. However, an urban development may not become a “truly low carbon” due to lack of low-carbon city appropriate definition, or due to complexity and confusion created by the programs, lack of existing policies to support including market-based instruments. Another evaluation was done on thirty-six cities of China low carbon pilot projects (Yang, Chun-Wang, & Zhao, 2018). The study showed, despite of various index system approaches to evaluate low carbon cities, no official index system has been confirmed for the evaluation of the development and indicators for its determinant.

Meanwhile, on the other side of the globe, another study was done on Strategy-based Model for Low Carbon Cities (SMLC) to evaluate and predict future performance whereby the model was applied to 17 cities that later tested on the major cities of London, New York, Barcelona, Dubai, and Istanbul (Hasyimi and Azizalrahman, 2018). It uses two different model; evaluative and predictive that resulting in predictive model being more dynamic in terms of forecasting future city condition in contrast to evaluative model that is conventional. Wei (2011) took a

different approach by evaluating the local land use comprehensive plans for low carbon city of the top 50 fastest growing population cities in the United States, with the objective to improvise low carbon city planning. She adopted Content Analysis Method for the evaluation and further continued her previous study in 2014 to evaluate the local land use plans adopting the similar method that consist of 5 protocols and 35 indicators to low carbon cities (Wei and Tang, 2014). Her findings showed that in most cases, the comprehensive low carbon framework has been established but some specific low carbon planning strategies were not included into the plans. Lastly, Zhang (2016) constructed Low-Carbon Indicator System – Sino (LCISS) which is an evaluation framework of low-carbon city development level and tested on the Sino-Singapore Tianjin Eco-City (SSTEC) project (Zhang, 2016). The results conform to the actual development situation of SSTEC whereby the city has advantages in low-carbon development with room for improvement in several sectors.

Most of the studies evaluate low carbon city quantitatively on various performance indicator, while the assessment on land use planning by Wei and Tang (2014) seems to have a significance results to land use planning as an important element. The study indicates the gap of other research on low carbon assessment at the most important stage of a development which is the initial stage. In Malaysia case, there were few studies done on evaluating sustainable development but none of Low Carbon Cities despite of having more than twenty cities adopting low carbon concept. Therefore, this study aims at filling the existing research gap to assess the comprehensive local land use plan for low carbon cities, in the midst of emerging Low Carbon Cities throughout the nation. So, the question arises; are the Low Carbon Cities in Malaysia can be considered low carbon enough? Is it possible to adapt Content Analysis Method to assess the existing comprehensive local land use plans and verify the Low Carbon City? The questions shall take it to the next part of which is the problem statement.

1.5 Research Aim and Objectives

The overall aim of this study is to assess the comprehensive local land use plan of low carbon cities in Malaysia. The result of this study will be used to measure the capacity of the comprehensive local land use plans in achieving low carbon city

planning and further encourage land use planning decision at the local jurisdiction. It may also be used to examine the key ideas, concepts and indicators for low carbon in relation to land use planning.

Based on the research gap identified from the existing literature, this study focuses on land use and land use planning against low carbon city backdrop. Followings are the specific objectives of the study:

- i. To assess the local comprehensive land use plans of selected low carbon cities in Malaysia, namely Putrajaya, Cyberjaya and Shah Alam by using Content Analysis Method for Plan Quality Evaluation technique;
- ii. To identify and examined the key ides, concepts and indicators for low carbon city in relation to land use planning;
- iii. To use the results of the study used to measure the capacity of the comprehensive local land use plans in achieving low carbon city planning and further encourage land use planning decision at the local jurisdiction.

1.6 Research Question

The following questions directly follow the objectives that are lined up above:

Question 1: How much have the growing cities in Malaysia implement low-carbon principles in their local comprehensive land use plans?

Question 2: What are the key ides, concepts and indicators for low carbon in relation to land use planning?

Question 3: Can the local comprehensive land use plans be improvised in achieving the low carbon city goals?

1.7 Scope of Study

The focus of this study is to assess the comprehensive local land use plans of three low carbon cities in Malaysia and administered by three (3) local jurisdictions namely; Shah Alam, Putrajaya and Cyberjaya. The study shall adopt Content Analysis Method applying low carbon protocols and indicators to verify the low carbon plans and initiatives taken by the three (3) cities. It is an adaptation of method by previous researcher in other developed countries with addition to the indicators applied in existing national assessment tools.

1.8 Significance of Study

There is a growing acceptance on the facts that land use planning and development strategies can be the key element in building a Low Carbon City. A compact city form can reduce travel demands and decrease fossil fuel consumption while a mixed-use development can reduce energy consumption. This study may provide opportunity to planners to create a holistic Low Carbon City through land use planning practices and process. Since most decisions about land use are made at the local level by public officers, local planners, stakeholders and citizens in cities, counties, metropolitan organizations, and special service districts, it is seen that the local comprehensive land use planning plays an important role in mediating the impacts of climate change (Tang, Hussey, & Wei, 2009).

1.9 Structure of Thesis

This thesis consists of five (5) chapters. The overall flowchart that represent the thesis structure is as shown in Figure 1.1.

Chapter 1 explains the research background and discusses on Low Carbon City in general in the introductory section, low carbon city in the local context of Malaysia in the research background, and further detailed the problem statement, research gap, research aim and objectives, research question, scope of study, significance of study and the structure of thesis.

Chapter 2 begins by reviewing the local land use plan in general and creating a link to comprehensive planning in the following section. Then, the chapter continues with brief understanding of Low Carbon City, the concept and its relation to land use planning. Then, it further elaborates on evaluation of plan quality; specifically of comprehensive local land use plans and Low Carbon City plans. The chapter then conclude the discussion of all the topics.

Chapter 3 describes the overall research design, technique and instrument use in this study. The data sources and collection process for both primary and secondary data are explained and the data analysis technique as well. In this chapter too that the analysis being executed and detailed.

Chapter 4 is the results derived from the assessment and analysis in Chapter 3. The result in presented qualitatively and quantitatively to indicate the performance of the selected sample plans in addressing climate change and low carbon development.

Chapter 5 is the last part of this research and will conclude the overall research findings on existing land use planning scenario in relation to Low Carbon City. In this chapter some recommendations are given for further enhancement in the practices and suggestions for future research directions.

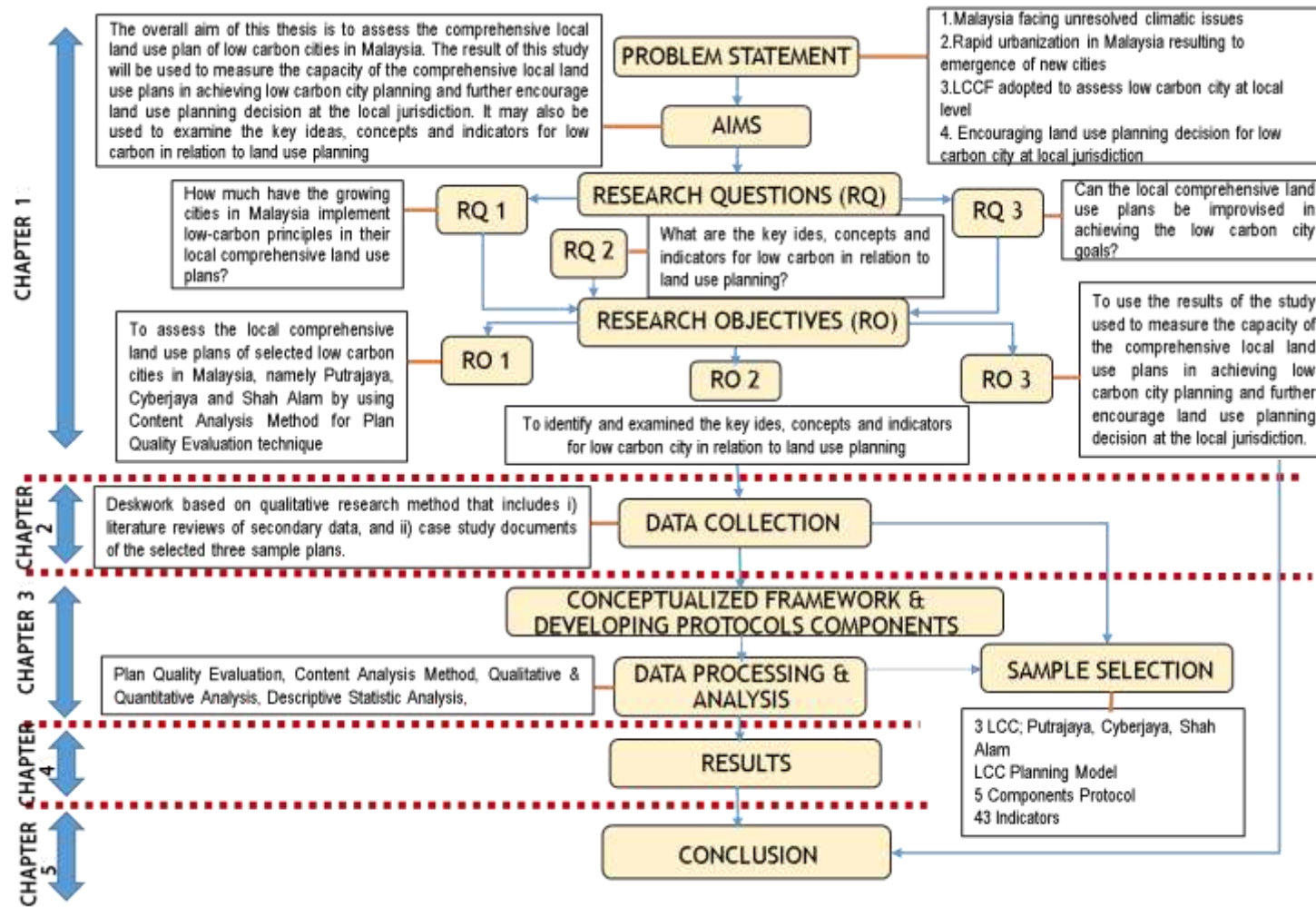


Figure 1.1 Research Flowchart

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