

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF SELANGOR
DENGUE INFORMATION SYSTEM
USING DESKTOP, WEB-BASED AND
MOBILE GIS FOR MANAGING
DENGUE DISEASE IN SELANGOR**

MUHAMMAD JAMALUDDIN BIN BAZLAN

Thesis submitted in fulfilment
of the requirements for the degree of
Master of Science
(Built Environment)

Faculty of Architecture, Planning & Surveying


November 2017

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.

Name of Student : Muhammad Jamaluddin bin Bazlan
Student ID No. : 2011794439
Programme : Master of Science (Geographic Information System) – AP780
Faculty : Architecture, Planning and Surveying
Thesis : Development of Selangor Dengue Information System Using Desktop, Web-based and Mobile GIS for Managing Dengue Disease in Selangor

Signature of Student : 
Date : November 2017

ABSTRACT

Dengue is one of the major health problems in Malaysia especially in Selangor, where the local current situation of the disease have been concerning public communities in the state. There are some dengue information system existed in the country, but the State Health Department of Selangor (JKNS) has requested in developing any proposed system in the department, where it needs to consider the aspects of spatial information sharing function, cost efficiency, and the staff capability in spatial data handling. Therefore, Geographical Dengue Information System (GeoDIS), is known as Selangor Dengue Information System (SDIS) was developed using three different GIS platforms (i.e Desktop GIS, Web-based GIS and mobile GIS) for practical implementation in the JKNS. Licensed and free open source software, consisting of Visual Basic, Microsoft.Office Access, and Quantum GIS (QGIS) were employed to produce dengue map and geodatabase system. Meanwhile, MapGuide and 000webhost were integrated to create online web base dengue map and publishing, then the mobile dengue applications was utilized with Wikitude for augmented reality visualisation. Standard Development Lifecycle (SDLC) is formal guidelines for system development, were adopted to achieve the objectives of the study; i) to study the user requirements for developing the prototype of SDIS, ii) to design and develop the SDIS, and iii) to implement and test the performance of the SDIS applications among the selected respondents in the department. Result from user requirement showed the average performance of current dengue system in the department need to enhance by applying a low cost and user friendly GIS-based information system. More than 87 percents of the respondents were agreed that the proposed system should contain basic GIS components/functions for the disease applications, such as data management, mapping and visualisation, data processing, data analysis and information sharing. The study also constructed an architectural framework for the SDIS with the approach of conceptual, logical and physical design, which is an useful guideline for relating model entities in the system. This framework was insightfully customized to develop the SDIS application, consisting of three menu phases; patient registration system, web-based system, and mobile application system. Furthermore, the SDIS offered five significant functions or components as requested by respondents, including patient data management, disease mapping and pattern visualization, geoprocessing and multicriteria analysis, and spatial information sharing. Overall, the SDIS was designed to integrate epidemiological information with the corresponding geographical components for local dengue spatial decision making and management tool in the JKNS. The prototype of SDIS was tested and 86% of respondents were satisfied with the system modules and components, however the component such as data management and storage capacity need to be heightend for big data manipulation, protection and standardazation.

ACKNOWLEDGEMENT

Glory be to Allah S.W.T the Almighty, all the praise to His Prophet Muhammad S.A.W. I am very grateful to Allah S.W.T for His Blessing and Grace for giving me self-confidence, patience, strength, endeavours and bring me this far in my life. First of all, a million of thanks go to my supervisors, Assoc. Prof. Sr Dr. Rosmadi bin Ghazali and Sr Abdul Rauf bin Abdul Rasam for their encouragement and constant support throughout my study.

My sincere gratitude -also goes to all my post-graduate colleagues for their encouragement, opinions and ideas throughout my research. I am also thankful to Jabatan Kesihatan Negeri Selangor (JKNS) and Department of Irrigation and Drainage of Selangor (DID) for their willingness to provide me useful information, cooperation and data for my research. Exploratory Research Grant Scheme (ERGS) from Ministry of Higher Education (MOHE), Malaysia is highly appreciated for the financial support.

I would like to thank the Centre of Studies for Surveying Science and Geomatics, Faculty of Architecture, Planning and Surveying (FSPU), and Institute of Graduate Studies (IPSiS) Universiti Teknologi MARA (UiTM) for giving me the opportunity to undertake this research with technical and skill support. The work would have not been completed without the assistance of several individuals. Thus, I am highly obligated to my family especially my mother, father and young sister for their encouragement and best wishes, my parents Bazlan bin Abd Rahman, Siti Zaimah binti Mahmud, my young sister Siti Nur Adila binti Bazlan.

TABLE OF CONTENTS

	Page
CONFIRMATION BY PANEL OF EXAMINERS	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xv
CHAPTER ONE: INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem Statements	3
1.3 Aim and Objectives	5
1.4 Significance of the Study	5
1.5 Scope and Limitation of Study	6
1.6 General Methodology	7
1.7 Thesis Organization	9
CHAPTER TWO: GIS AND DENGUE INFORMATION SYSTEM (DIS)	10
2.1 Introduction	10
2.2 Dengue Epidemiology	10
2.2.1 Dengue Situation in Malaysia	12
2.2.2 The Causes of Dengue Outbreak	15
2.2.3 The Transmission and Distribution of Dengue Outbreak	16
2.3 Geographical Information System (GIS) in Dengue Studies	17
2.3.1 Components of Geographical Information System (GIS)	19
2.3.2 Geographical Information System in Public Health	19
2.3.3 Geographical Information System (GIS) in Dengue Epidemiology	20